ELECTRICAL TIMES

THURSDAY
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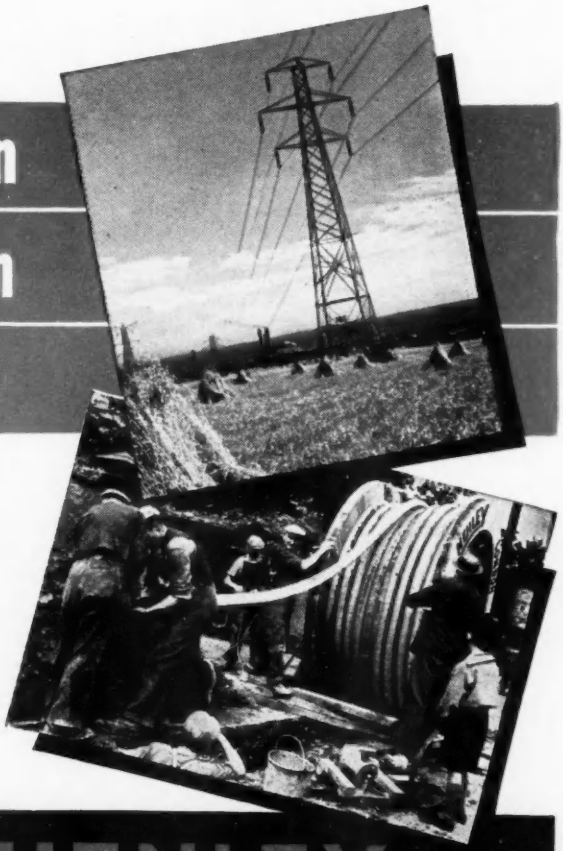

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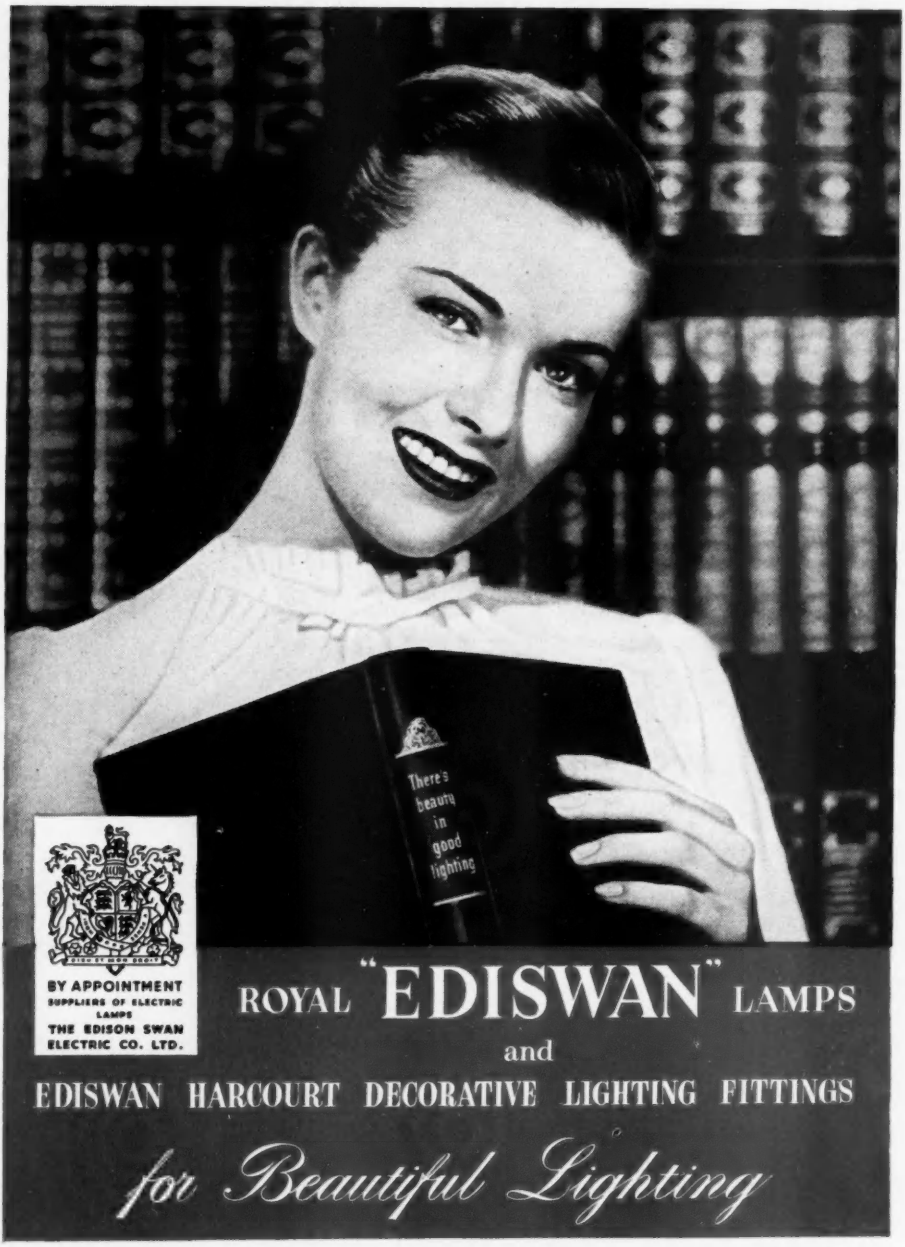

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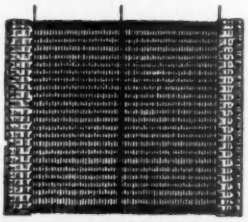

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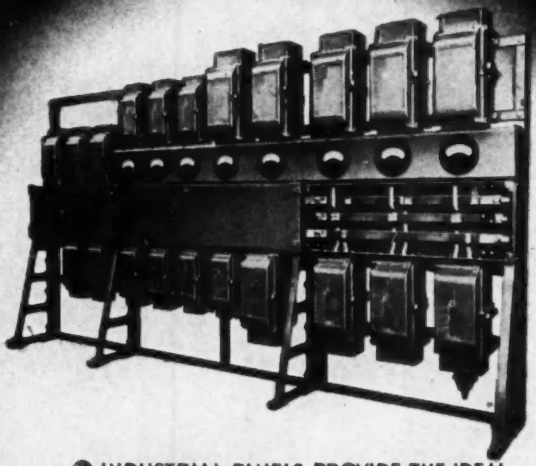

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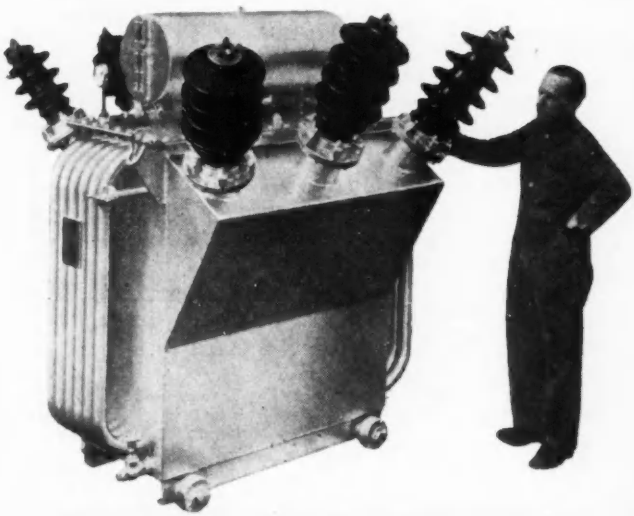

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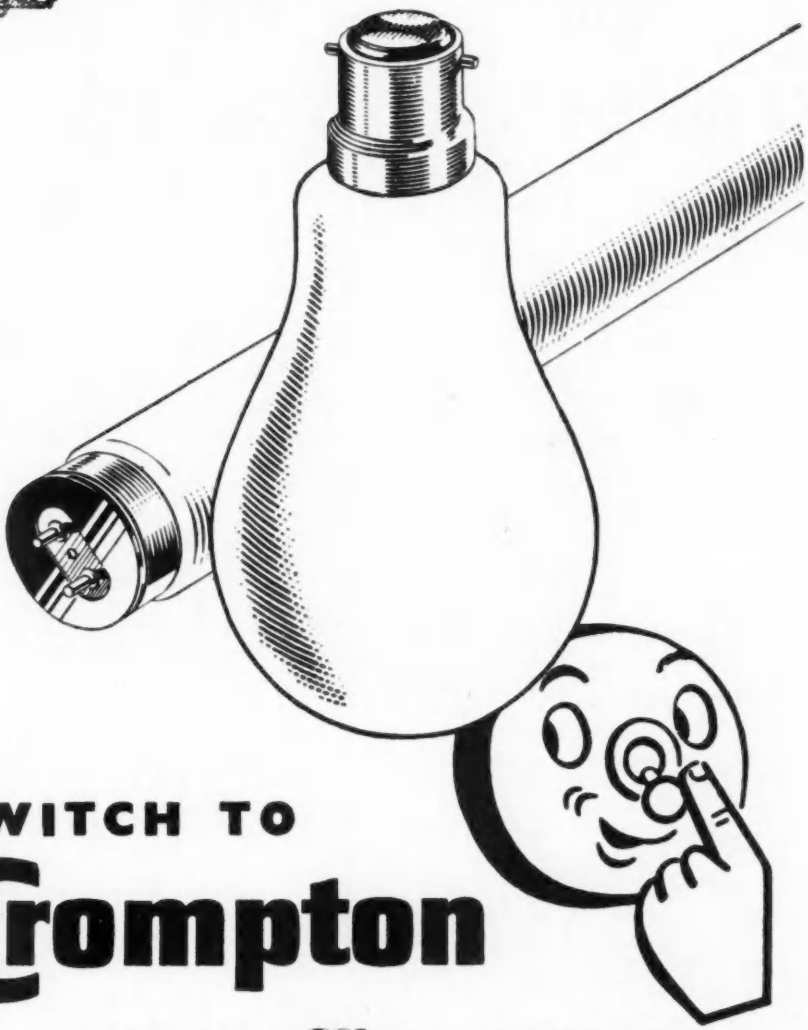

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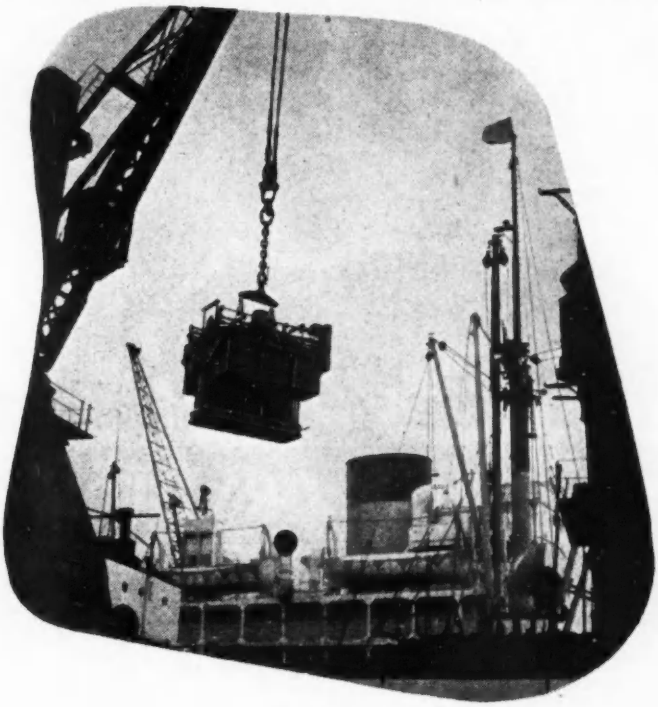

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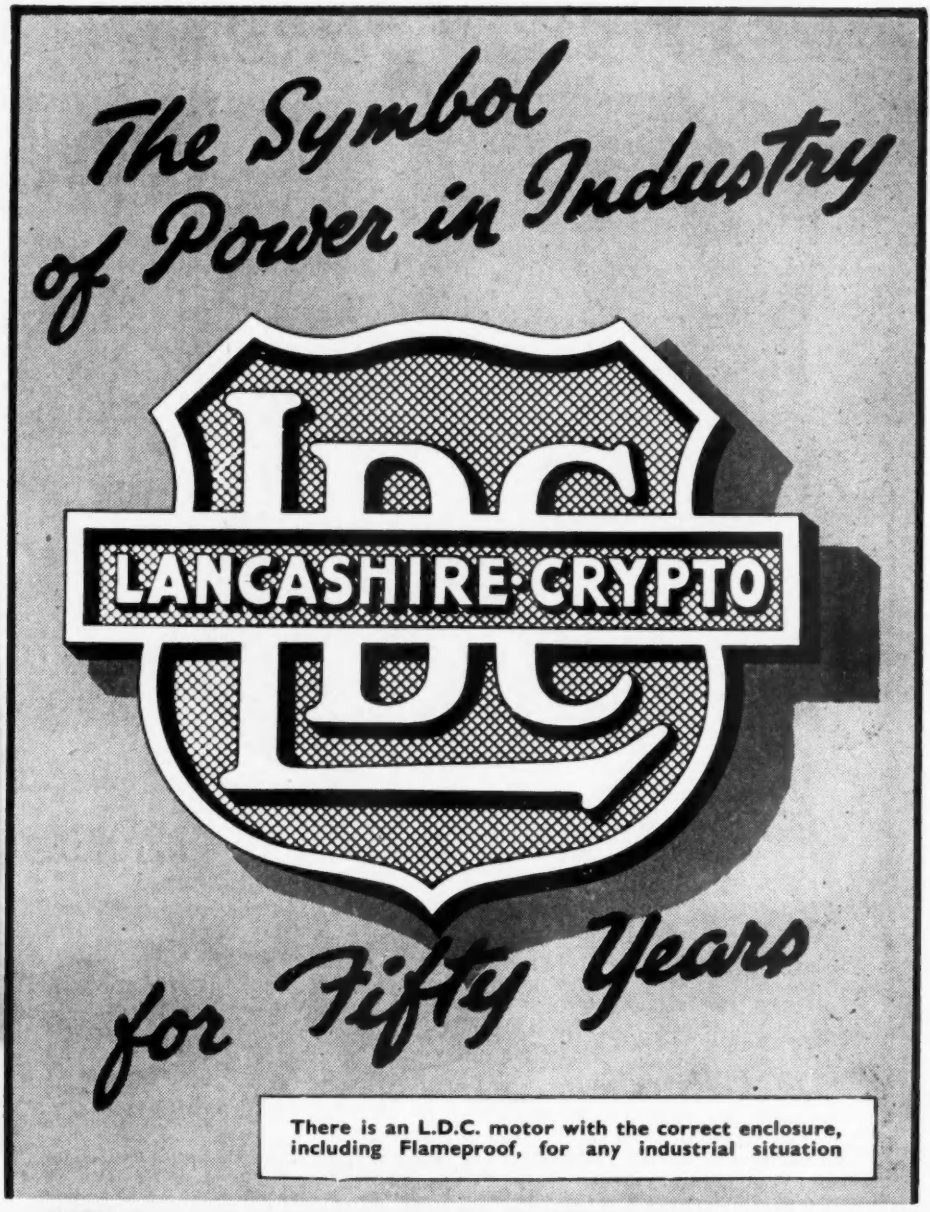
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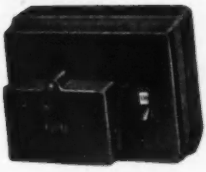

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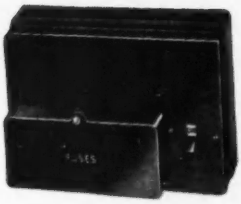

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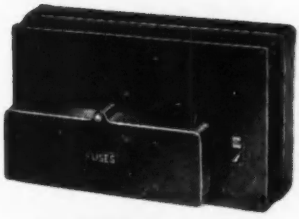

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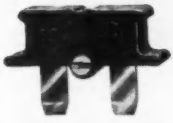

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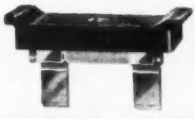

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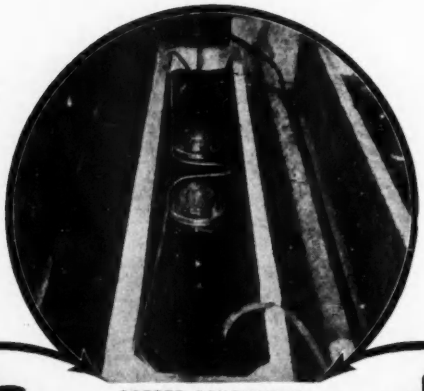

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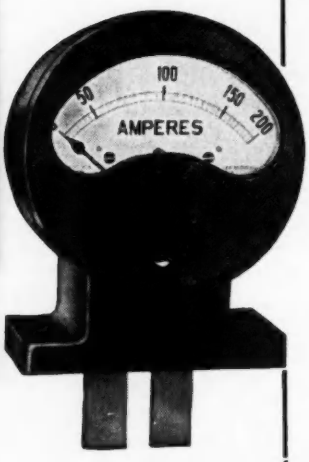

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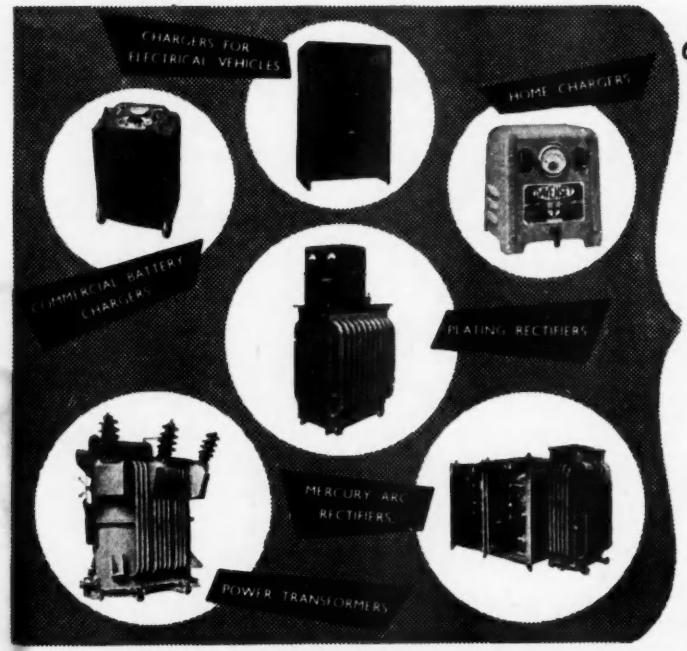

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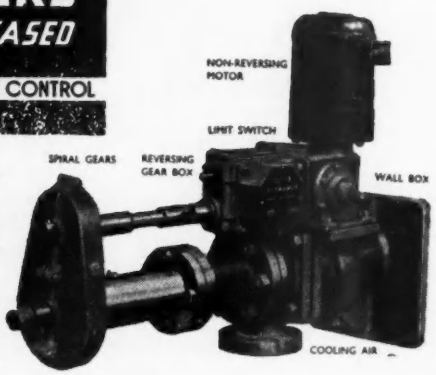

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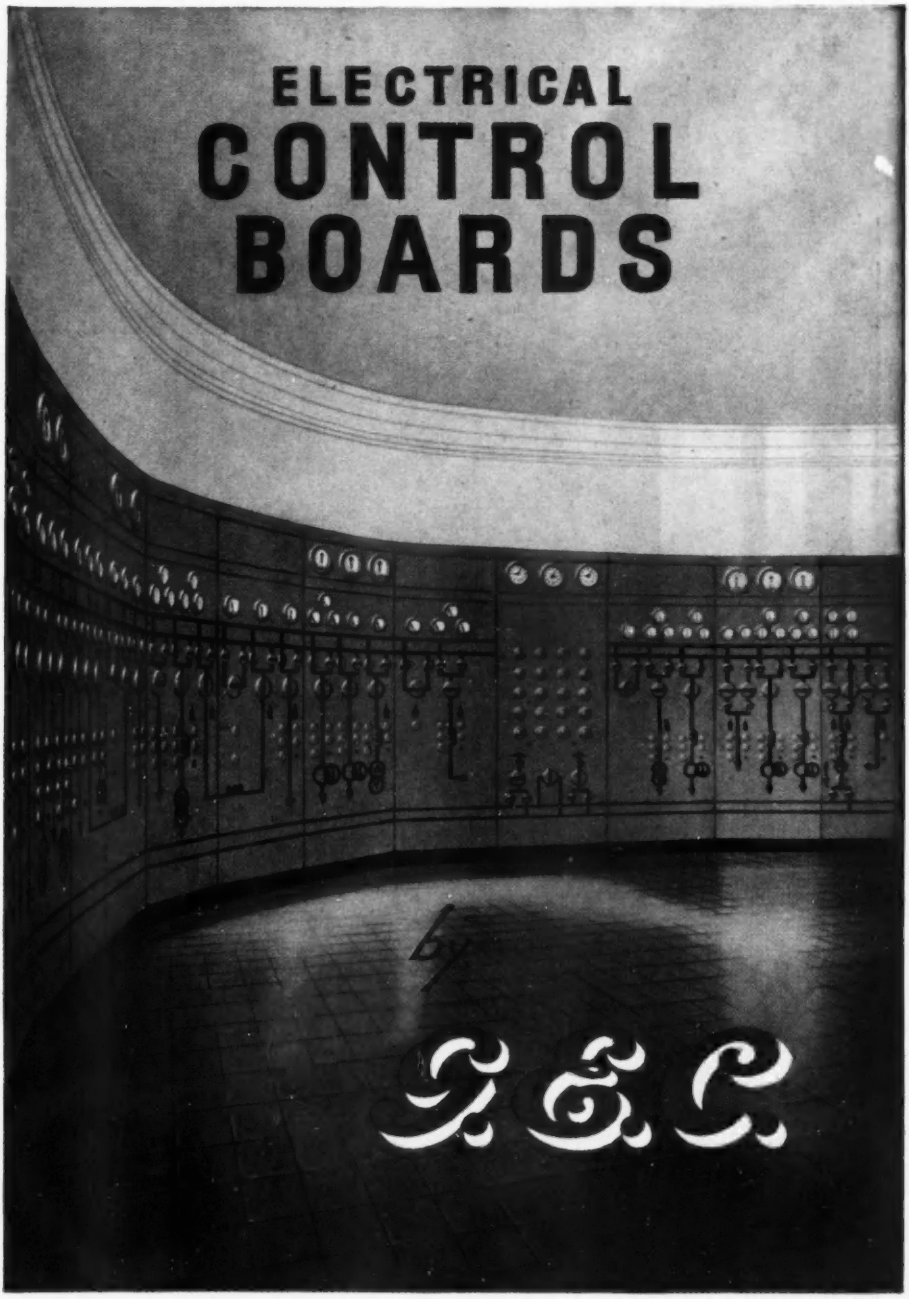

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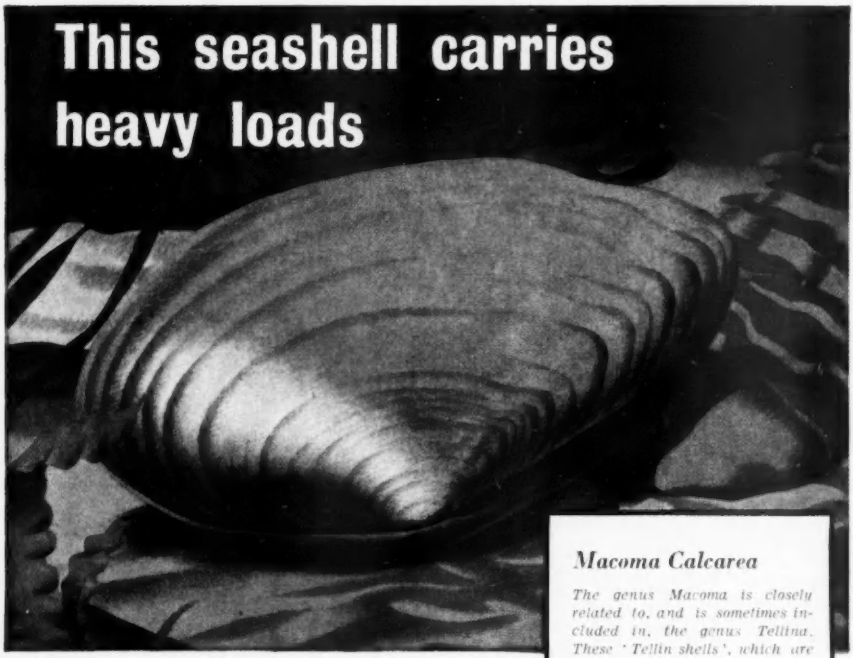

Macoma Calcarea

The genus Macoma is closely related to, and is sometimes included in, the genus Tellina. These 'Tellin shells', which are found the world over, are distinguished from other shells by the two lateral teeth in one of the valves. Macoma Calcarea, illustrated here, has, as its name implies, a hard, white shell. It is covered with a thick epidermis and is found off the coasts of Iceland and Greenland. Shell Macoma Oil is one of the wide range of Seashell Oils, all of which are named after seashells.

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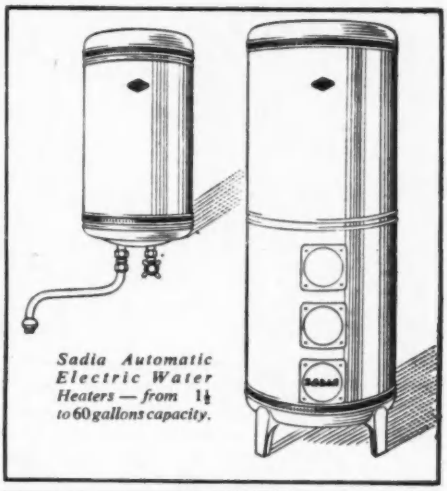

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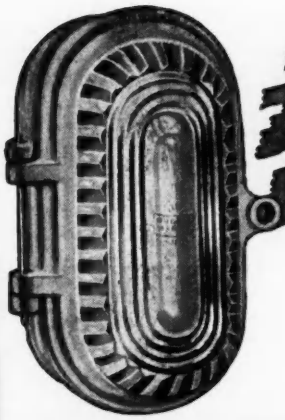

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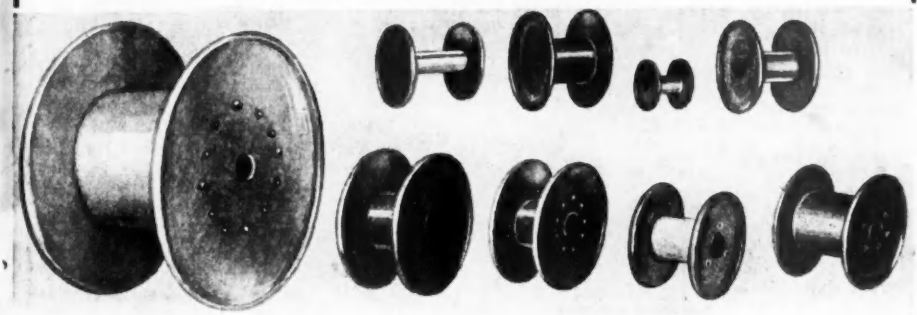

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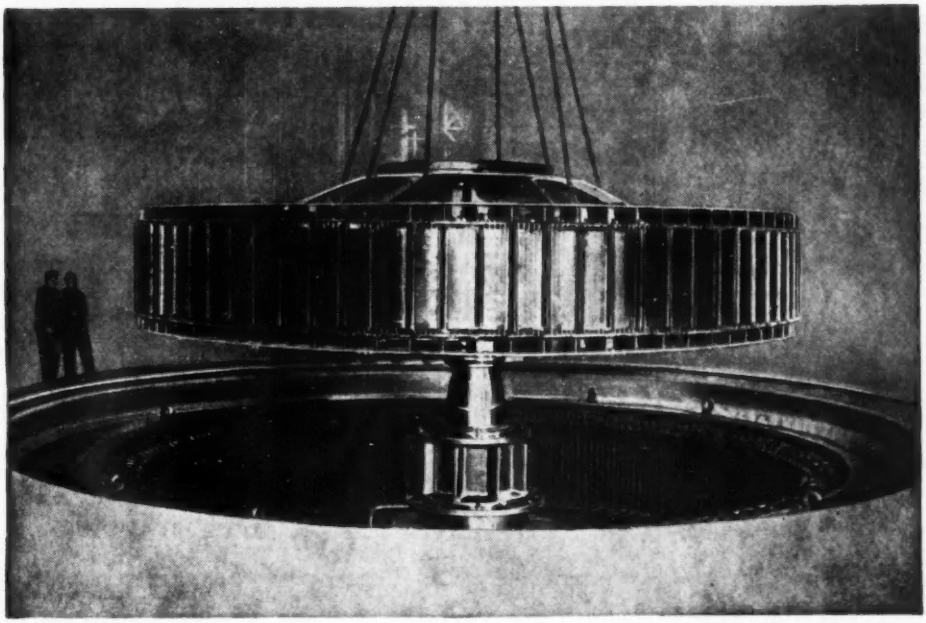
Finland's largest hydro-electric generator



The photograph shows the erection of the first of three Metrovick 18,000 kVA generators at Tainionkoski generating station of Enso-Gutzeit.

These machines are not merely the largest hydro-electric generators in Finland, but the largest so far made in Britain—the stator is 36 ft. in diameter.

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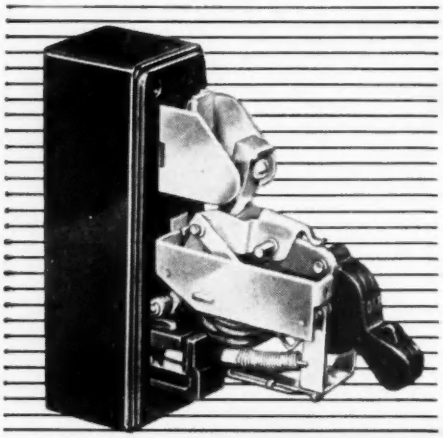

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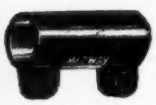

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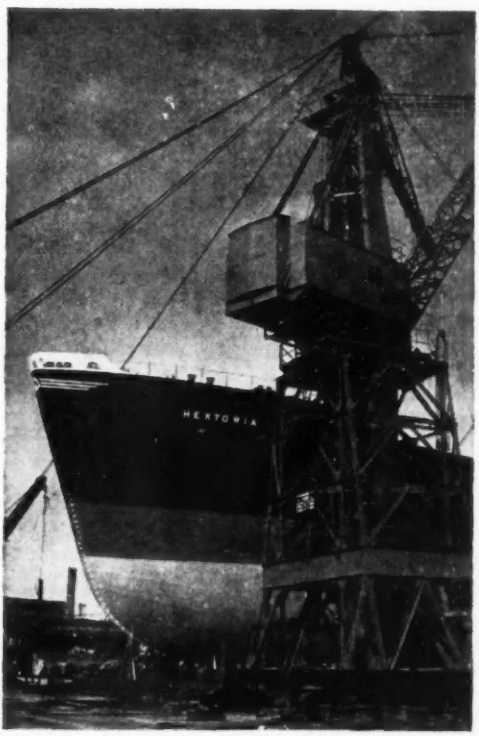

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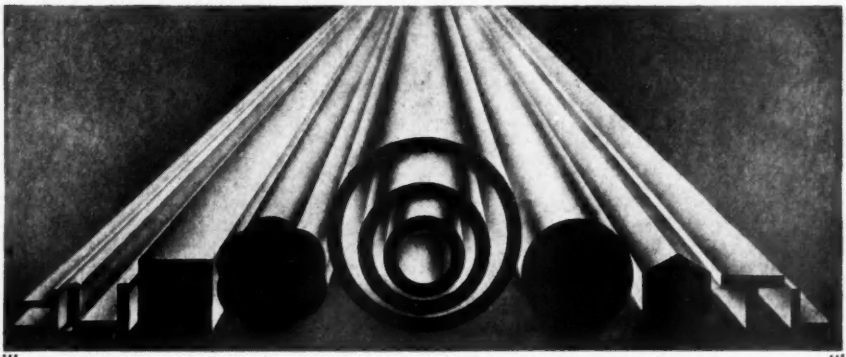

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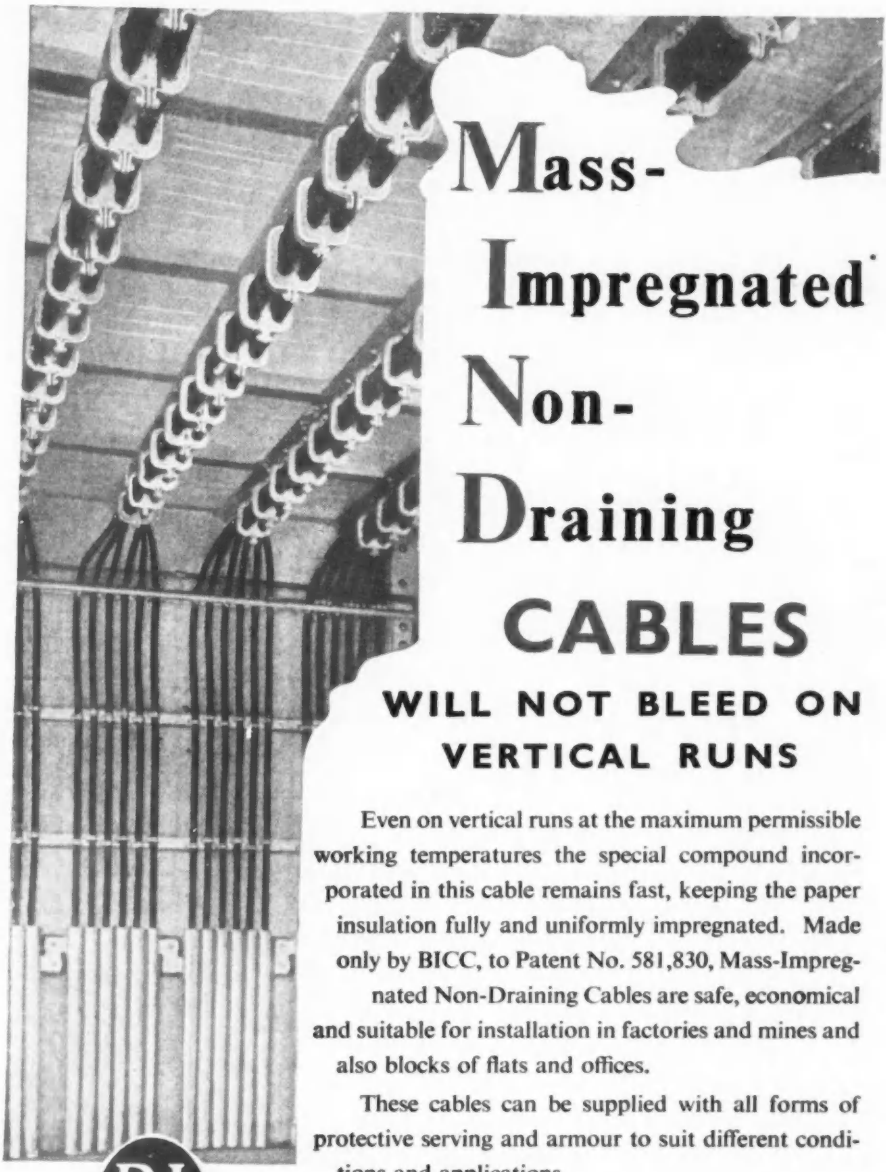

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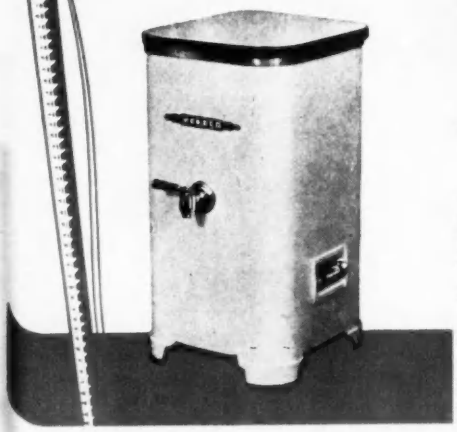

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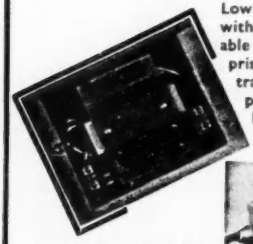

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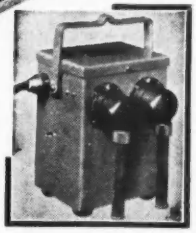

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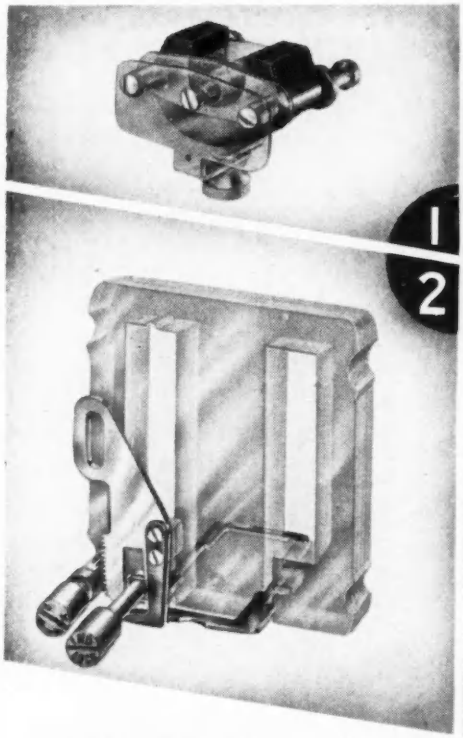

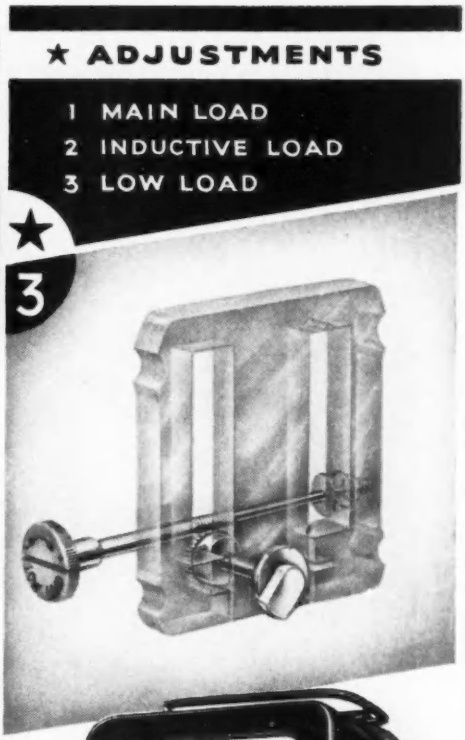

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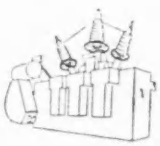

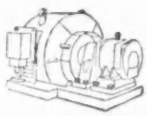

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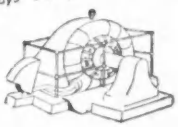

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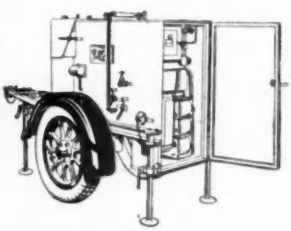

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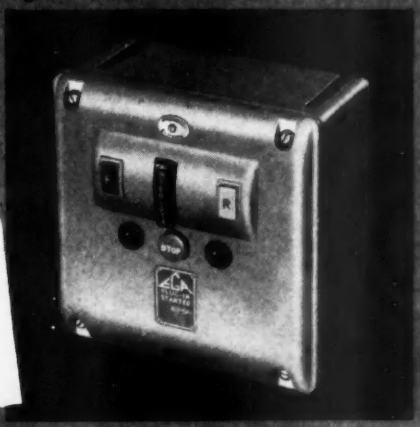

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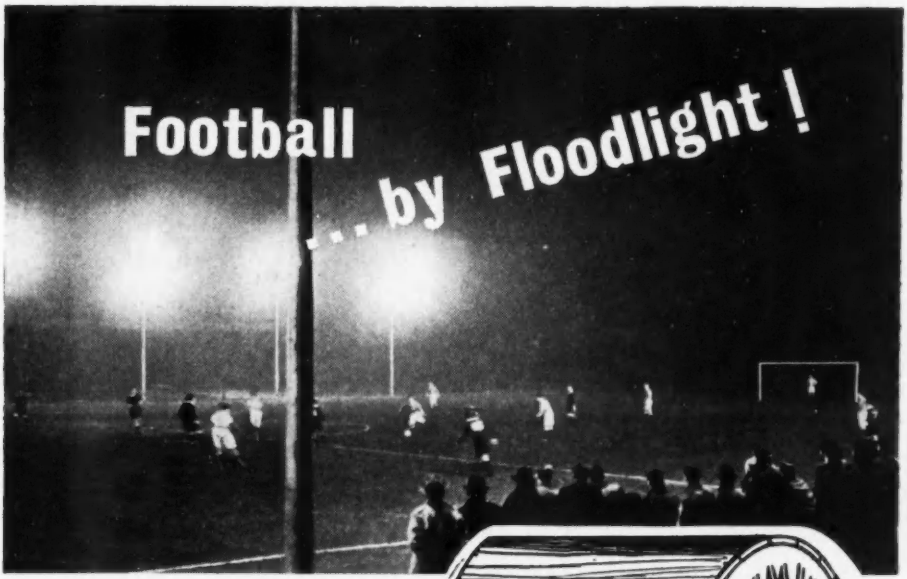

A Daily Express photograph

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J. & P. Aluminium Sheathed Cables were chosen by Mr. Wm. Toovey, the Contractor, for the flood-lighting installation at Manchester United's training ground.

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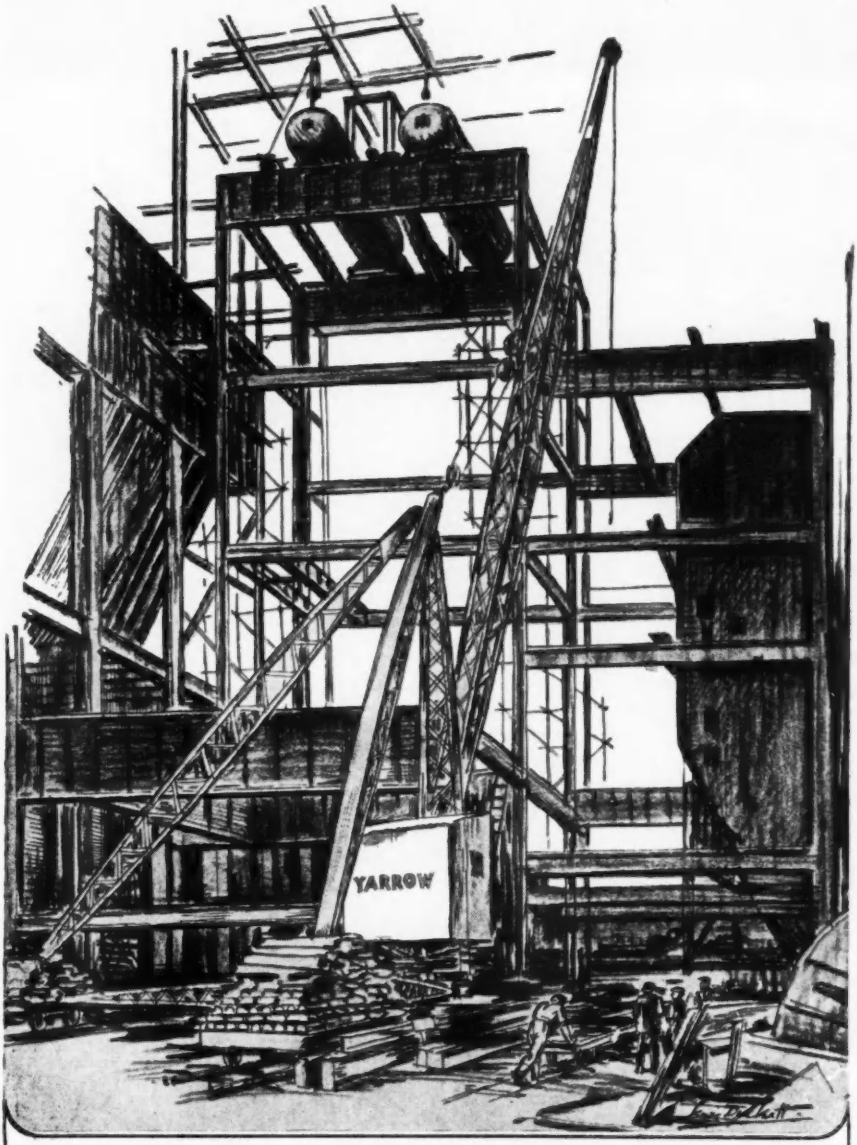

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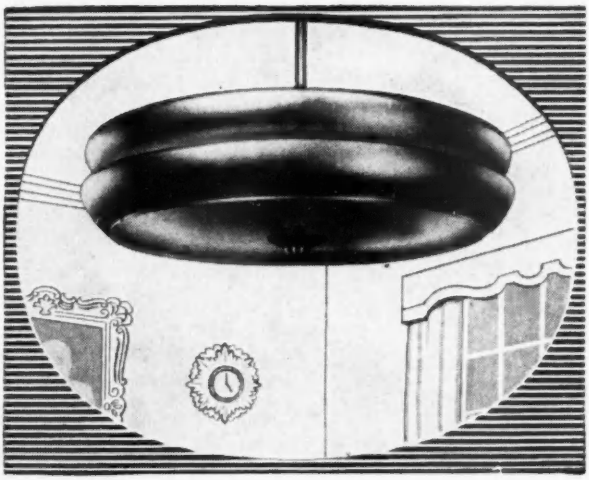

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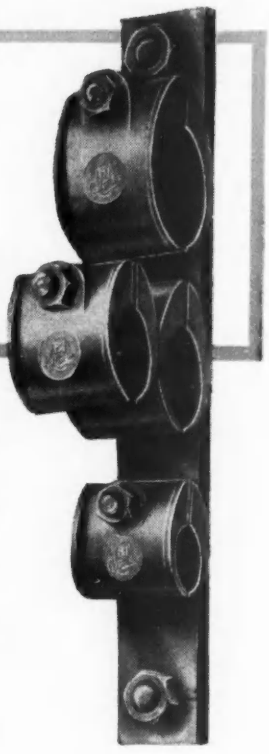
Simplify cable erection with BICC CLAW-TYPE CLEATS



BICC Claw-Type Cleats are a new invention, devised by our engineers, to make cable installation rapid and easy.

Light and strong, they consist of interchangeable units made from a corrosion-resisting alloy.

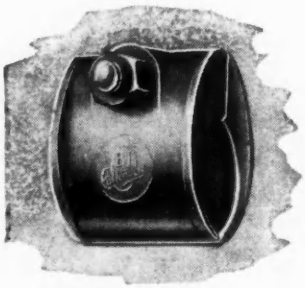
They minimise the need for special steelwork;

Are compact and space saving;

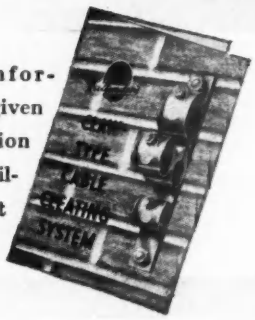
Solve cleating problems in difficult situations;

Provide for extensions and adaptations with minimum disturbance of existing cables;

And allow maximum accessibility to cables on multi-cable runs.



Further information is given in Publication No. 287N, available on request



B.I. Callender's

CLAW-TYPE CABLE CLEATS

(Patent applied for)

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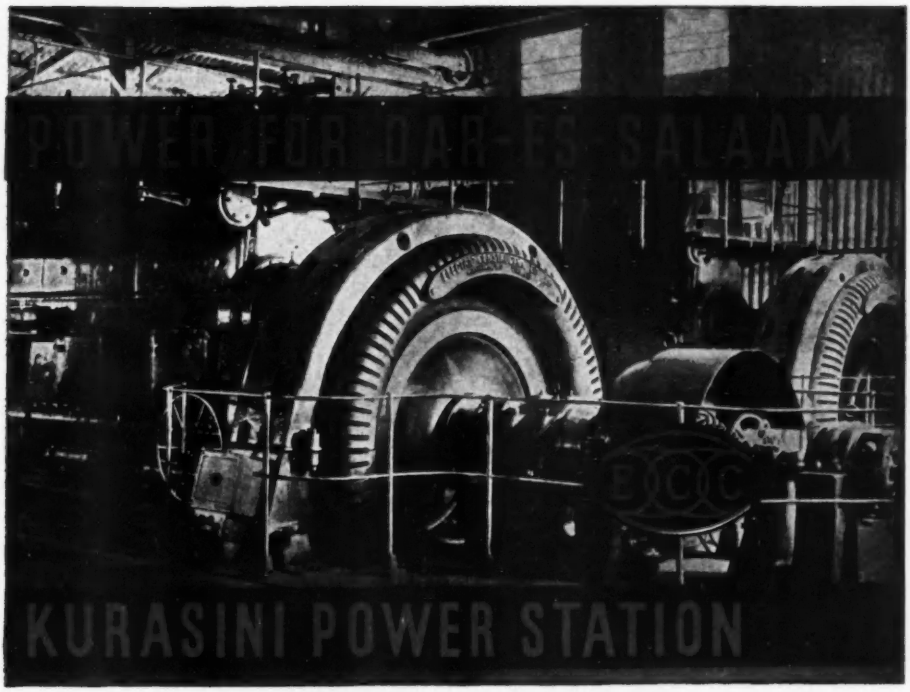

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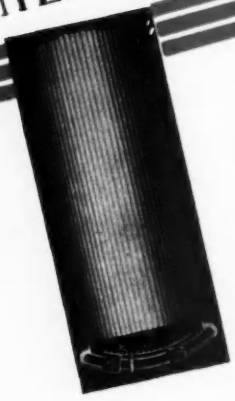

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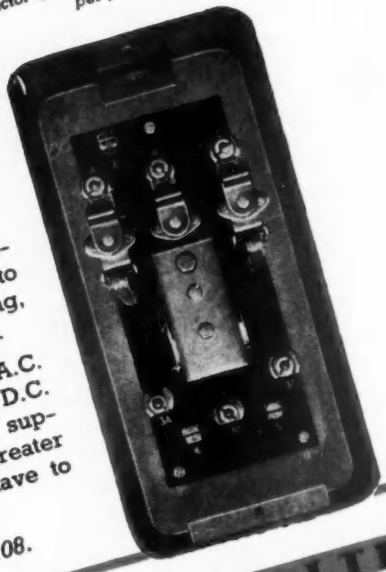

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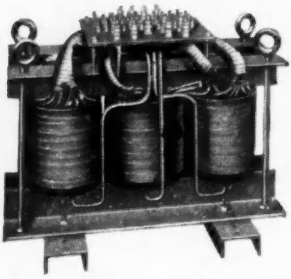

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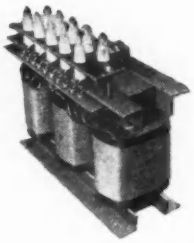

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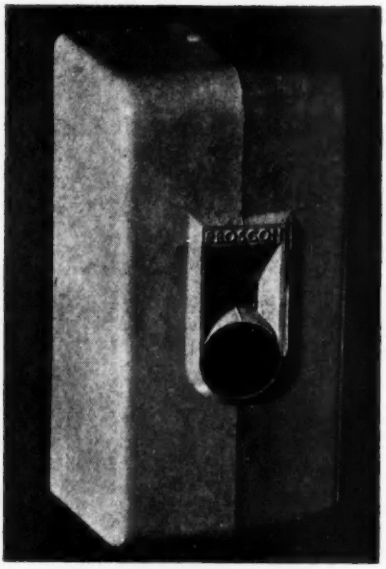

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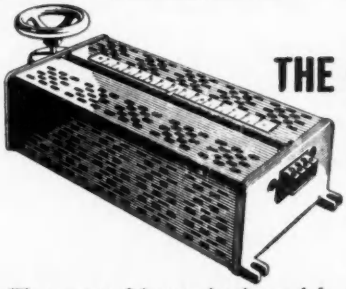

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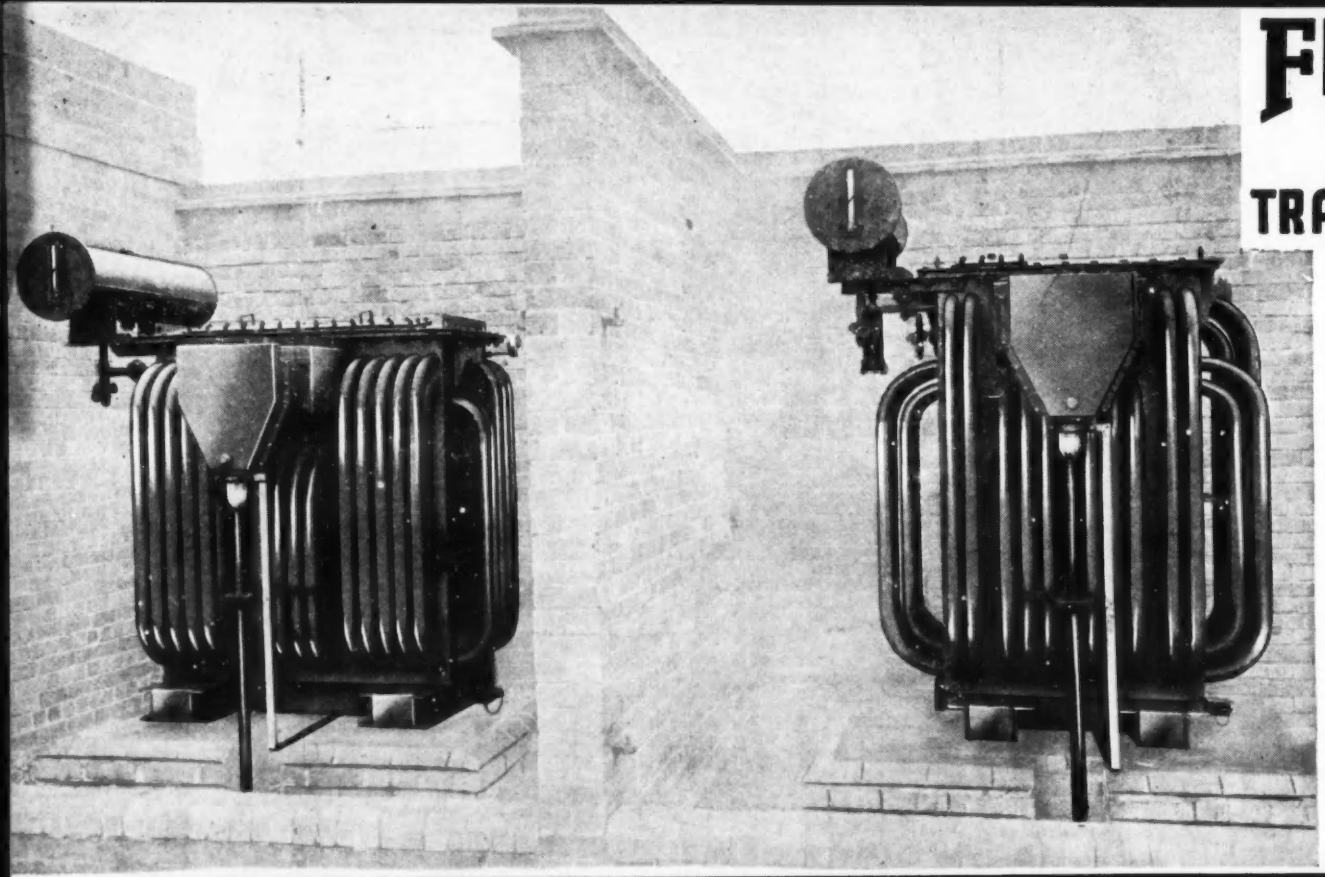

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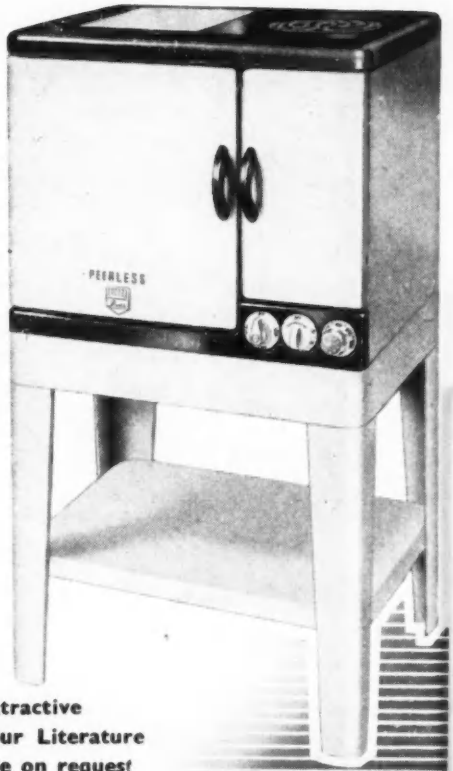

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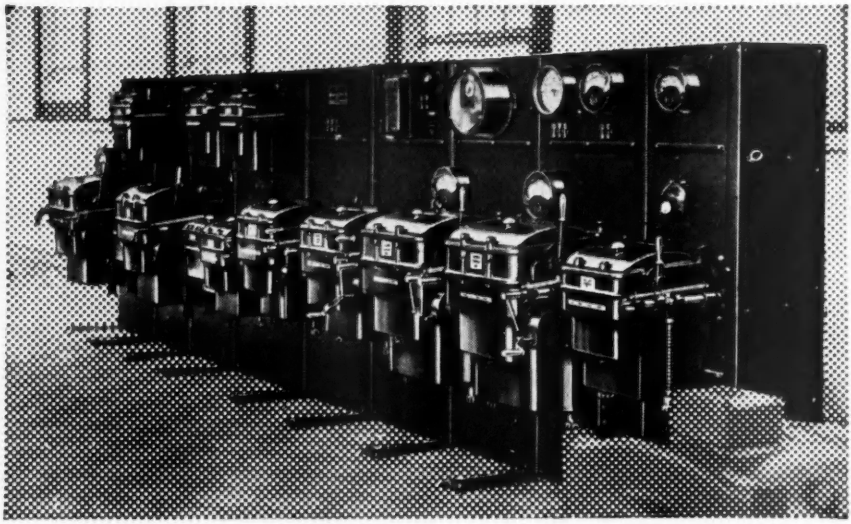

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ELECTRICAL TIMES

Vol. 119 No. 3094 THURSDAY, 22 FEBRUARY, 1951

PUBLISHED EVERY THURSDAY

SIXTIETH YEAR OF PUBLICATION

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Editorial

PROMOTION

THE first two studies of the Acton Society Trust on nationalised industry dealt with essentially political questions; the third discusses a vital matter of internal organisation, that of promotion policy. The basic conflict is clearly enunciated; should promotion be based on merit, as good management requires, or on seniority, a simpler if less effective method advocated by trade union interests to overcome the suspicion and distrust which surrounds managerial appointments that do not patently follow such a rule. The study outlines some of the attempts at compromise between these opposing viewpoints, which have not had much success, and it is made clear that this problem is one deserving of much greater consideration than appears to have been given it in nationalised industry. It is suggested that the persistent demand for seniority may not be so deeply ingrained as might at first be thought, and a call is made for an analysis of its nature. Without a vigorous attack on this inherent problem, it would seem that the inevitable trend will be towards promotion by seniority, with no provision for rectifying errors in appointment; in other words an approach to a civil service type of organisation. The real difficulty is that there is no competitive examination for management, nor can there well be one. But if an empirical test for administrative efficiency could be devised, then with the adoption of probationary appointments, at least some answer might be found for the distrust from the employee side which is almost the sole essence of the difficulty.

HEATING EFFICIENCY

WE are likely to hear a good deal more of the table of efficiency of methods of continuous room heating given in Parliament last week, since it shows electricity in none too favourable light. And whatever use is made of the table for propaganda purposes, it is certain that the careful qualifications made by Mr. Herbert Morrison in presenting the figures will be conveniently forgotten. First, it must be stressed that the table relates only to continuous room heating and not to the occasional use for which electricity is so suitable and efficient. Secondly the comparison is with gas and coal burnt in closeable open fires. The latter is one of several modern types which are not always favoured by the user and require not only correct installation and skill in use, but also the proper grade of fuel and a correct rate of airflow, a factor which also affects the efficiency of gas appliances. While the figures are not of themselves open to question, those relating to gas and coke are of pre-war vintage and presumably make no allowance for the quality of fuel that is all too common today. On the other hand, in rounding down the figure of electricity to 20% efficiency, but keeping gas to the nearest figure, the table is hardly complimentary to the recent increase in average power station efficiency. Such comparative tables are no new thing to doughty supporters of electricity's claims that overall long-term efficiency is only one of many criteria by which heating appliances should be judged.

THE GAS ARC

IT is a well-known truism that the practical applications of a new scientific development are frequently not appreciated even some time after their discovery. Possibly one of the most striking examples is the fact that even such an acknowledged authority as the German *Handbuch der Physik* stated, as late as 1928, that there was no future for the fluorescent coating for electric discharge lamps. It is, therefore, only natural that our description of the Siemens xenon arc lamp, given in a review of Dr. Aldington's paper in our issue of December 23, 1948, should not make any prophecies regarding future possibilities. Yet to judge

from the further paper, read before the I.E.S. by Mr. Cumming on Tuesday of last week and reviewed elsewhere in this issue, this lamp may yet challenge the compact source mercury lamp for certain fields of application. True, its life is still limited (although a couple of years' development has produced a lamp rated at 500 hours), but it possesses the great advantage of a spectrum which is, for all practical purposes, continuous, and an ability for instant starting, thus eliminating both the preliminary warming-up period, and the "simmering" losses during temporary inactivity. Furthermore, in applications such as signalling, there is no necessity for high-speed shutter gear, the design of which is not by any means a simple matter. While it is not suggested that the gas arc is going to revolutionise the lighting industry in the same way as the fluorescent lamp, it seems that for many applications notably colour projection, it has a considerable future which is not yet generally realised.

LOCK-OUT OR LOCK-IN?

AN interesting new angle on the use of reclosers on rural distribution systems is given in a recent issue of the *Electrical World*. Hitherto, a recloser has been regarded as a device to save service costs by clearing transient faults with only momentary interruption of supply, and without the long outages and replacement costs inseparable from blown fuses. On permanent faults, however, it would only lock open after two or three reclosures, so that a short circuit on a remote spur was quite capable of shutting down the entire line. Based on the theory that reclosers are too expensive to be used for protection against transient faults only, this latest idea employs reclosers combined with graded fuses in both main line and spurs. Transient faults are cleared by the recloser before the fuses can blow, but if the fault should prove permanent, the recloser locks *in*, not out, after two operations, thus forcing clearance by the appropriate fuse, and giving protection against both types of fault with the minimum of system disturbance. Attractive as this scheme appears at first glance, there are a number of snags in applying it over here. In the first place, American reclosers are much faster and American fuses much slower than their British counterparts. The problem of designing a recloser to beat the tetrachloride fuse would be no mean task for a designer, particularly if an equivalent rupturing capacity were required. With 4 kV distribution, instead of 11 kV, lower transformer capacity and longer lines, the odds are heavily in favour of the American set-up.

LAMPS FROM A HAT

TO Meteor, the Faraday lecture represents one of the most enjoyable events of the year. For him the Central Hall has the same appeal as does the stadium to the football fan or the Horticultural Hall to the model engineer. For this is one lecture where it is not necessary to be ever on the alert for the single sentence which may prove the key to a complex proposition. Relaxed and at ease, one can enjoy the show, in the manner of an amateur conjurer watching a first-class professional. One knows that the lady is not really being sawn in half, but there is infinite pleasure in watching the magician's technique. This, incidentally, is an appropriate simile for this year's lecture, where the timing of each effect and the masterly stage management resembled nothing so much as the performance of a first-class troupe of illusionists, and spoke volumes for the work put in by the "back-stage boys" at rehearsals. Each rabbit, as it were, arrived so promptly on its cue that, had the demonstration of the colour-rendering of sodium light resulted in the lady vanishing in a puff of smoke, we should all have merely felt it was a new development in lighting technique, and applauded accordingly. Having regard to the quality of the entertainment combined with instruction which the I.E.E. offers on these occasions, it is a little disappointing to find the general public so sparsely represented in the London area, although in the provinces it "plays to capacity." Maybe some fluorescent posters would help.

Meteor

Protective Coverings *for Metal Sheathed Cables*

A Survey of present-day practice

By C. C. BARNES, A.M.I.E.E., A.I.I.A.

ALMOST from the inception of electric power transmission by insulated power cables lead (and its alloys) have been the only material used extensively for the metallic sheathing, but 1948 introduced the commercial production of aluminium-sheathed cables.

Both lead and aluminium cased cables are dependent for their continued effectiveness upon the integrity of the metal sheathing;[1] in addition however, every precaution must be taken to protect the metal sheathing from possible damage in service due to external influences, and the various forms of protection adopted are reviewed in the following notes.

Steel Armoured Cables

The coverings normally applied external to the lead (or aluminium) sheath are as follows:

Two compounded paper tapes; layer(s) of jute roves (or hessian tapes); steel wire armouring or double layer of steel tape; layer(s) of jute roves (or hessian tapes).

B.S.480: 1942 (Paper Insulated Cables for Electricity Supply), unlike earlier British Standards for power cables, specifies a double layer of compounded paper tapes directly over the lead sheath of served and/or armoured cables. The purpose of this protection is to maintain a heavy layer of bituminous compound over the lead sheath, and thereby separate it from the textile wrappings. The protective layers applied between the metal sheath and steel armour is termed the "bedding," while "serving" implies the protection external to the steel armouring (or external to the sheath of an unarmoured cable). At the present time the following alternatives as commonly employed:

BEDDINGS

(i) Two paper tapes, one cotton and one hessian tape (P_2CH).
(ii) Two paper tapes and two hessian tapes (P_2H_2).
(iii) Two paper tapes and one layer of jute roves (P_2J).

SERVINGS

(i) Two hessian tapes (H_2).
(ii) One layer of jute roves (J).

Since the early days of cable making, compounded jute roves have been widely used by the cable industry. So far there has been no general tendency in British Standards to define the exact construction of beddings and servings, but merely to specify the nominal total thickness of fibrous materials required. Present-day practice indicates however, that the future trend of textile protection for armoured cables buried in normal soil will consist of two compounded paper tapes, and two hessian tapes (or one cotton and one hessian tape) for the bedding, and a double layer of hessian tapes (assuming raw materials are freely available) for the serving of armoured cables. Steel armouring of power cables is usually considered necessary for the following reasons:

(1) As a protection against damage to the metal sheath. (2) For difficult installations in which the cable is liable to severe handling. (3) As an extra protection against vibration. (4) For use where the cables are laid in mining areas or ground liable to subsidence. (5) Submarine cables, subject to tidal effects.

An efficient and economical protection for cables buried direct in the ground is provided by a double layer of steel tape armour; each tape is applied helically, with a gap between convolutions to permit bending, and the second tape is applied over the gap of the inner tape to ensure that the cable is adequately protected. Steel tape armoured cables provide a good protection against crushing or penetration by sharp bodies, but this type of armouring must not be used where it is liable to tensile stresses. Standard thicknesses of steel tape armour and textile servings as recommended in B.S.480 : 1942 are given in Table 1.

TABLE No. 1. CABLES—STEEL TAPE ARMOURED AND SERVED

Minimum tabulated diameter of cable over the lead sheath (in.)		Nominal thickness		
Above	Up to and including	Bedding	Each steel tape	Serving
in.	in.	in.	in.	in.
0·5	0·75	0·100	0·030	0·100
0·75	3·00	0·100	0·040	0·100
3·00	—	0·100	0·060	0·100

Small cables (of ¼ in. diameter or less over the lead sheath) which require mechanical protection, are wire armoured because of the manufacturing difficulties which will be experienced in applying a double layer of steel tape around such cables, (*vide* Clause 14 B.S.480: 1942). Single wire armoured cables are more expensive than the double steel tape armoured construction, but they are always used where an armouring having longitudinal strength is required (e.g. armoured cables pulled into ducts, for river crossings, where there is a likelihood of ground subsidence, and for cables hanging on brackets alongside railways or in tunnels, etc.). Thicknesses of steel wire armour and textile servings to B.S.480: 1942 are given in Table 2.

TABLE No. 2. CABLES—SINGLE OR DOUBLE WIRE, ARMOURED

Minimum tabulated diameter of cable over the lead sheath (in.)*		Nominal thickness		
Above	Up to and including	Bedding	Diameter of armouring wire	Serving
in.	in.	in.	in.	in.
—	0·50	0·100	0·064	0·100
0·50	1·05	0·100	0·080	0·100
1·05	2·00	0·100	0·104	0·100
2·00	—	0·100	0·128	0·100

* Or minimum tabulated diameter over laid-up cores in the case of "SL" type cables.

The requirements for galvanised steel wires for armouring power cables are dealt with fully in two recent B.S. Specifications,[2,3] and B.S.443 (first issued in 1932 and later revised in 1939) specifies the method to be adopted for testing the zinc coating on galvanised wires. Cables in mines[4] have to comply with the Coal Mines Act, which contains the following requirement:

" . . . all parts of an earthing system including the armouring of a cable where this is connected to the earth system are required to have a conductivity at all joints at least equal to 50% of that of the largest conductor used solely to support the apparatus. . . ."

For small conductivity of the steel armour alone is well above the permitted limits, but as the conductor cross section increases it becomes necessary to take into consideration the conductance of the lead (or aluminium) sheath, in order to ensure that the metallic covering possesses the required conductance.

The metal sheath may be considered as a second conducting path in parallel with the armour, and as it is in the form of an annulus, its cross sectional area may thus be easily determined. Its resistance, in the case of a lead sheath will be about 12·5 times[5] the resistance of a copper conductor, having the same cross sectional area, whereas the corresponding ratio for an aluminium sheath is 1·65 (i.e. the greater conductivity of an aluminium sheath can be a factor of considerable importance in mining work). For lead covered cables having large conductors it happens, in some cases, that the combined resistance of the steel wire armour and lead sheath is below that fixed by the Coal Mines Regulations. In this case, it is necessary to introduce into the armour a number of tinned hard drawn copper conductors having a diameter equal to the diameter of the steel wire armour. As the conductivity of copper is about eight times greater than an equal cross section of steel, the substitution of one copper wire for one steel wire is equivalent, electrically, to adding seven more steel wires to an all-steel wire armour. Double steel tape armoured cables are not intended to be used underground in mines where the Coal Mines Act is enforced. Table 3 gives a summary of standard textile servings, and the metallic armourings applied over the metal sheathed cable, together with the method of installation associated with each type of finish.

Unarmoured Cables

Lead covered cables wrapped by two well compounded paper tapes and a layer of compounded jute roves or hessian tapes are sometimes buried direct in the ground, but when this method of installation is adopted, care must be taken to ensure that the cable trench is free from stones, and covered with a layer of riddled earth, to provide a soft bedding for the cable. Such cables must also be protected by cover boards or tiles—cable makers usually specify a minimum depth of laying of 30 in. for unarmoured 660 V to 22 kV cables.

Preservation of Wrappings

The textile wrappings previously referred to are thoroughly dried and pre-impregnated prior to their application around the cable, and then they are well coated in carefully selected bituminous compounds in order to preserve the textile wrappings. All the materials used for the bedding and serving of cables are primarily carriers for the water-resisting compounds, and the best type of covering may be dependent to some extent on the type of compound used.[6] Early armouring compounds consisted of coal tar products, and experience revealed that they could cause corrosion of the lead sheath—later developments in other industries then made available supplies of petroleum residues, which are technically

preferable. These petroleum residues in time came to be graded according to their nature and consistency, and were found to be a more satisfactory medium for the impregnation of cable beddings and servings.

Special Coverings

The fibrous protective coverings in B.S.480: 1942 are suitable for normal soil conditions, but where there is a risk of severe chemical and/or electrolytic corrosion[7,8], which sometimes occurs adjacent to power stations, chemical works, or in ground containing sewage (organic acids) or stray earth currents, two alternative but more expensive non-fibrous finishes are adopted. The alternative protections referred to below are desirable, since the fibres in the normal coverings tend to act as small channels allowing the passage of moisture to the metal surface, and although the amount of corrosion is not large, it is usually concentrated over a very small area which quickly damages the sheath.

(1) Packer Protection.

(2) Rubber Sandwich Protection.[9] (Various modifications of this form of protection embodying a rubber tape layer are now available.)

With the Packer protection an initial serving of two paper tapes and one cotton tape is followed by an open helix of ebonite strings 0·10 in. diameter over which are laid a cotton tape and a final hessian tape. During manufacture the spaces between the strings are filled with bituminous compound which, in combination with the non-fibrous ebonite provides a waterproof barrier preventing the ingress of corrosive agents.

The "Rubber Sandwich" consists of:

One rubber tape with about 30% overlap, one cotton tape with about 20% overlap, one rubber tape with about 30% overlap, one cotton tape with about 20% overlap, one well compounded hessian tape.

This "Rubber Sandwich" protection is based on the idea of interposing a non-fibrous water impermeable membrane between the outside of the coating in contact with the soil, and the inside of the coating in contact with the metallic sheath. Furthermore, the special rubber tape used has bitumen incorporated in it, so that it harmonises (i.e. is compatable)

TABLE 3. POWER CABLE ARMOURING AND SERVINGS

	Protection over the dielectric	Method of installation	Comments
1	Lead or lead alloy sheath (without external wrappings)	On cleats or cable racks in buildings, power stations, underground electric railways and other positions which are normally inaccessible.	A lead alloy sheath is recommended for positions where vibration may occur, e.g. on bridges, roof girders, under roads carrying heavy traffic, etc.
2	Lead sheath, two compounded paper tapes, textile serving (jute roves or hessian tapes).	Laid direct in the ground.	Must be protected by cover boards, or tiles and laid only in soil known to be free from chemicals. The bottom of the cable trench must be free from stones and covered with a layer of riddled earth to provide a soft bedding for the cable.
3	Lead sheath, closely compounded braid of cotton, jute or asbestos.	In free air.	Mainly for mining work, ships' installations, or inside buildings. The asbestos braided finish provides an excellent fire-resisting covering.
4	As (2) followed by a double layer of compounded steel tape, compound textile serving overall.	Low and medium voltage cable circuits laid direct in the ground.	Must not be used where the armouring is subject to tensile stresses.
5	As (2) followed by a single layer of steel wires left bright.	(1) Cables in free air. (2) Pulled into ducts.	When installed in or around buildings it is important to specify whether for inside or outside use so that the most suitable type of armouring compound may be used.
6	As (5) followed by compounded textile serving over the steel wire armouring.	Alternative to (4) but chiefly used for higher voltage cables laid direct in the ground.	More expensive than D.S.T.A. but offers a good mechanical protection.
7	As (2) followed by first layer of steel wires, compounded textile separator, second layer of steel wires, compounded textile serving overall.	Mine shafts, submarine cables, or special conditions (i.e. large copper sections where the weight of the cable has to be taken by the wire armouring).	In many cases D.W.A. is preferable to S.W.A. because smaller wires can be used and greater flexibility is obtained, also necessary where the required tensile strength cannot be obtained with S.W.A. Often essential for mining work where the requirement is specified that the metallic covering shall have at least 50% of the conductivity of the largest conductor (particularly for non-lead sheathed types, i.e. vulcanised bitumen, or compound insulated cables).

with the bituminous layer in which it is embedded. It is claimed that the above protection is also designed with respect to elastic properties, so that ground movement and differential movements of the cable with respect to the ground will not crack or damage the corrosion resisting protection. In recent years various other forms of special protection incorporating a rubber layer have been developed by various manufacturers, but such protections are usually confined to the special designs of gas or oil filled super voltage cables.[10]

The effectiveness of a corrosion protection is assessed by immersing a short length of cable or lead tube, suitably wrapped, in a saline solution and applying a steady d.c. potential of 10 volts between the electrolyte and the protected metal, the latter being positive. Daily measurements are taken of the leakage current (milliamps) passing through the protective coating, and any increase in the current is a measure of the gradual breaking down of the protection.

The electrolyte is heated daily to a temperature of (say) 50-70° C, maintained at this temperature for a period, and then allowed to cool—this heating cycle is adopted to simulate the loading conditions of an underground power cable.

Recently the Sheaths and Coverings Sub-Committee[11] of the (American) Insulated Conductors Committee mailed a questionnaire to representative cable users and manufacturers, in order to determine their views on the use of protective jackets with lead sheath cable. Most of those responding recommended neoprene hose and plastic jackets for prevention of corrosive action, and some believed that these coverings may protect lead sheath cable from mechanical damage. The following extract from the summary of answers to the questionnaire is of interest:

"Twenty-nine of the thirty-four users replying employ cable with jacket coverings to protect against corrosion. The majority of these employ protection only for special applications, but there is interest in the possibility of general use. The users believe that the covering may be of value in increasing sheath life through mechanical reinforcement, but only six companies have made any tests, and little or no data have been collected to indicate the thermal effect of protective jackets. Neoprene hose jacket has been most commonly used, but there is some interest among the cable users in extruded thermoplastic jackets. The possibility of reducing the lead thickness on lead sheathed cables with protective jackets is well recognised by cable users, and many have already employed reduced thicknesses of sheath on jacketed cables. Tests of the effect of jackets on cable life are being conducted by the majority (of manufacturers), but the results are not yet available. The manufacturers recommend jacket thicknesses of from 90 to 125 mils for usual cable diameters, increased up to 145 mils for larger cables. If recommended jackets are employed, a reduction in lead sheath thickness of from 20-33⅓% of normal is suggested. The majority of the users of jacket cable limit its use to special applications. . . ."

The use of special protective coverings is a problem which still requires a good deal of detailed investigation, and the hard test of long time operating experience. In particular, carefully conducted tests based on laboratory and field experience are of interest on the relative merits and long time effectiveness of the protective coverings applied over the metallic reinforcing tapes of the self-contained gas or oil filled cables, and also for protecting the steel pipeline design against corrosion and electrolysis.

Non-magnetic Armourings[12]

Magnetic steel armour may, in general, only be employed when it encloses all the conductors carrying alternating currents, whose vector sum is zero (e.g. twin "go and return" conductors, or the three conductors of a three-phase circuit).

In such cases there is practically no magnetic field round the assembled conductors, but this condition evidently does not hold with single core cables which, if armoured with ordinary magnetic steel wire (or tape), will result in very serious heating losses arising from the alternating flux in the armour.

For cases where the metallic protection of single core cables is considered essential, non-magnetic armouring may be employed but the use of such protection is restricted by the mechanical properties of the armouring material itself, and by its resistivity.

Technical details of two types of non-magnetic armouring materials are given below:

(1) Copper-silicon-manganese alloy (Patent No. 497259) having approximately the following characteristics:

Resistivity	=24·6 microhms/cubic centimetre (i.e. conductivity about ⅐th of annealed copper).
Specific gravity	=8·54
Tensile strength	=25·6 tons/sq in.

(2) Hard drawn aluminium alloy (Patent No. 336408) having the following general characteristics:

Resistivity = 3·1 microhms/cubic centimetre.
Specific gravity = 2·73
Tensile strength = 20—25 tons/sq in.

The final choice is dependent on the individual installation conditions obtaining but, in general, where non-magnetic wire armoured single core cables are installed, not more than 6 in. apart, the high resistance (copper-silicon-manganese) armouring is used.

Conversely, when the cable spacing is greater than 6 in. a low resistance material is generally more suitable and for such cases a hard drawn aluminium alloy will be suitable.

An armouring is sometimes employed in which a percentage of non-magnetic wires is distributed among the steel wires, in order to increase the magnetic reluctance and keep the losses to a minimum. Again, bronze wires, particularly of the higher resistance varieties could be arranged to give small losses, and low losses can also be obtained by the use of non-magnetic steel.

It is important, however, to note that non-magnetic armourings make the cable very expensive and it is therefore desirable to obtain the co-operation of the cable maker, by providing full details of the proposed method of installation in order to ensure that the most economical type of wire armouring is used.

Aluminium Sheathed Cables

To date over 200 miles of aluminium sheathed[13] power cable for voltages up to and including 11 kV have been supplied and installed by one manufacturer, since the sheathing plant began commercial production in July, 1948, and the possible increasing use for this type of cable has focused attention to the protective methods necessary.

When aluminium sheathed cables are installed in air, the natural oxide film provides protection in all but strongly corrosive environments.

The primary hazard, therefore, under normal atmospheric conditions, is contact with other metals which are electro-positive to aluminium, e.g. copper, brass and, to a lesser extent, iron.

In general there is no necessity to provide any form of protective covering for aluminium sheathed cables in air, except where the sheath is in contact with above metals, e.g. at joints, bonding points, etc.

These conditions should be avoided by insulating the sheath from the other metal, or by plating the contact metal with cadmium or zinc, which are below aluminium in the electro-chemical series.

Unlike air exposure conditions, long-term experience of the behaviour of aluminium in contact with soils is not yet extensive and experience on this point is being collated.

In a recent C.I.G.R.E. paper, P. M. Hollingsworth[14] summarised results of his experience to date as follows:

"In normal near-neutral soils where electrolytic concentrations are low, a high purity aluminium sheath will not be attacked even if laid bare and under conditions of heavy waterlogging.

On the other hand, if the soil is so alkaline as to have a pH value greater than 8·5 corrosion by alkaline attack may occur. It is widely accepted that aluminium is readily susceptible to attack by alkalies but a highly alkaline soil condition is comparatively rare.

Acidic conditions do, however, from time to time occur in soil and are known by pH values

TABLE 4. MINIMUM BENDING RADII FOR SOLID TYPE CABLE

Working voltage	Type of cable	Method of installation			
		Laid direct	Drawn in ducts	Adjacent to joints and terminals	
				With "Former"	Without "Former"
Up to and including 11 kV	All types.	12 x OD	12 x OD	8 x OD	8 x OD
22 kV and 33 kV	3 core with or without armour excluding SL type.	25 x DOL	40 x DOL	15 x DOL	15 x DOL
	3 core SL type.	25 x OD	40 x OD	15 x OD	15 x OD
	Individual cores of SL types	—	—	15 x DOL	25 x DOL
	Single core	40 x DOL	40 x DOL	15 x DOL	25 x DOL
66 kV	All types of single core.	40 x DOL	40 x DOL	15 x DOL	25 x DOL

OD = Overall diameter. DOL = Diameter over lead sheath

of 5·0 or less. Aluminium is comparatively immune from attack by organic acids which can have such disastrous effects on lead and it is not readily attacked by sulphur or nitro-acids, but in all acidic conditions attack on aluminium is liable to be accelerated by the action of chlorides, traces of which are often present in soil. Such conditions may occur in very localised areas in a soil, the general nature of which is, to casual examination, innocuous, resulting in local attack or pitting."

The following are the alternative methods of protection (for aluminium sheathed cables), one or other of which is invariably adopted for underground situations:

(A) *For near neutral soil conditions.*

(*a*) Coating of waterproof compound; (*b*) two layers of bituminised paper tape; (*c*) coating of waterproof compound; (*d*) layer of bituminised hessian tape; (*e*) coating of waterproof compound; (*f*) overlapping layers of bituminised hessian tape; (*g*) coating of waterproof compound.[11]

(B) *Where corrosive conditions are suspected or known to exist.*

(*a*) Coating of waterproof compound; (*b*) layer of bituminised cotton tape; (*c*) two layers of water-impervious rubber compound tapes; (*d*) layer of bituminised cotton tape; (*e*) coating of waterproof compound; (*f*) overlapping layer of bituminised hessian tape; (*g*) coating of waterproof compound.

A very desirable future development is one overall protection which is sound technically and which is also comparatively cheap, so that it can be applied to all aluminium sheathed cables which are buried direct in the ground or installed in any position where there is a possibility of corrosion.

Minimum Bending Radius

In order to avoid damage to the sheath and overall protection of the cable during installation, the radius of the bends to which cables are subjected should always be as large as circumstances permit.

Recommended minimum bending radii factors for solid type impregnated paper insulated cables for various conditions of installation are given in Table 4.

After the cable has been taken off the drum it should not be bent to a smaller radius (either during handling or when in position) than is stated in Table 4. The bending radii obtained from the table are minimum values.

If the radius exceeds 6 ft by using the factors given in the table, 6 ft may be taken as the minimum bending radius.

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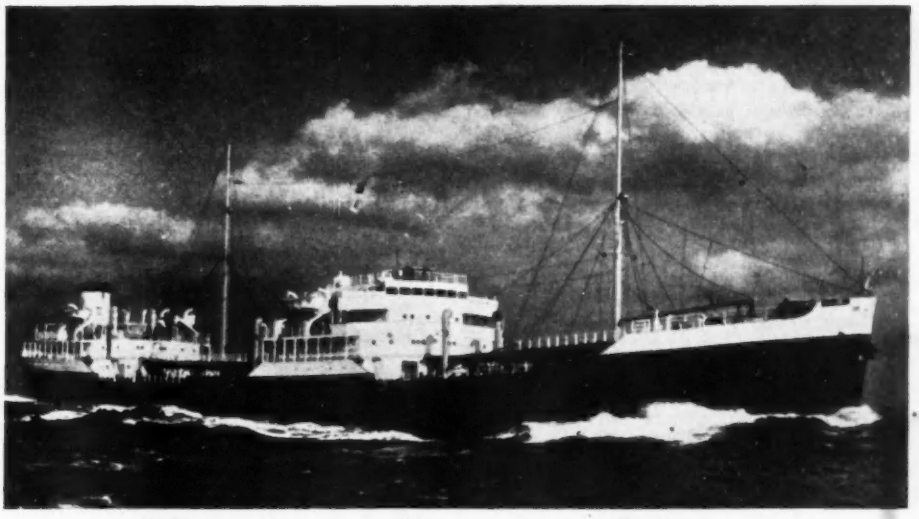
Multiple Conductors

MULTIPLE conductors used as the phase wires of overhead transmission lines have many attractive qualities when very high voltages are in use. Investigations that have been carried out on the subject were reviewed on Tuesday by Mr. E. J. HOLMES, B.SC. (ENG.), in a paper read before the I.E.E. London Students' Section. Early American work showed that with two conductors per phase, a 20% increase in power rating and a 30% increase in current-carrying capacity was possible for a given total conductor cross-section. These increases result largely from decreased reactance; another advantageous quality is increased corona initiation voltage.

Four countries have started multiple-conductor schemes since the war, including Great Britain. In America the Tidd project aims at determining suitable conductor sizes and spacings for 500 kV. France is investigating the use of multiple conductors to facilitate the change from 220 kV to 400 kV, and a special test station was set up at Chevilly, near Paris. Duofoil losses at 400 kV in good weather were about equal to those of 220 kV single conductor lines.

In Sweden, lines with double conductors are already in operation, at present working at 220 kV, with a series capacitor; 380 kV lines of this type are expected to come into use this year. Compared with an equivalent single conductor system, the extra cost has been about 21%, with a 30% increase in transmitting capacity.

In conclusion, the author described tests which he had carried out at Queen Mary College, using double conductors of up to 0·125 in. diameter in a 2 ft diameter test cylinder. A h.v. Schering bridge was used to measure power losses, and the effect of cable size and spacing was determined.



Marine Gas-turbines

First Commercial marine gas-turbine propulsion unit completed by B.T.H.

WHEN the Anglo-Saxon Petroleum Co. ordered their diesel-electric tanker, d.e.s. *Auris*, consideration was given in the general design to the possibility of introducing a gas-turbo-electric unit in place of one of the four diesel-electric sets. A contract was accordingly placed with the British Thomson-Houston Co., of Rugby, for the design, development and manufacture of a 1,200 b.h.p. gas turbine unit driving an 860 kW 50 c/s three-phase alternator.

Owing to the fact that reliability was a major factor and space restricted, the thermal efficiency aimed at was not particularly high nor was the layout (from the point of view of accessibility) the best that could have been achieved without restrictions.

Machine Arrangement

As can be seen from the diagram, a two-shaft arrangement was adopted, the compressor and h.p. turbine shaft being mounted parallel to and vertically above the l.p. turbine and alternator shaft. A comparatively simple cycle has been utilised, the flow sequence being intake, compressor, heat-exchanger, combustion-chamber, h.p. turbine, l.p. turbine, heat-exchanger, exhaust. Two combustion chambers are used, each located on a horizontal plane, with axes parallel to the h.p. turbine. An electric motor rated at 50 h.p. is used for running up the compressor-h.p. turbine shaft for starting.

The alternator is a fairly standard type of machine and is located underneath the compressor. Closed-air-circuit cooling is provided. Between the l.p. turbine and the alternator is a bearing housing which carries the barring gear.

A by-pass valve is also provided to allow gas to be passed when necessary directly to atmosphere via the heat exchanger from the h.p. turbine exhaust. This valve has two functions. First, it is a safety device. Should the speed of either turbine shaft reach trip speed, the valve opens and the fuel supply is shut off, thus preventing overspeeding of the alternator shaft in the event of a failure of the electrical load. Second, it facilitates starting, as by keeping the valve open during the initial period, the back pressure in the h.p. turbine is reduced and the turbine can provide greater power to the compressor at starting speeds. Thus the power demand from the starter motor and the time required for starting are both reduced.

Design Details

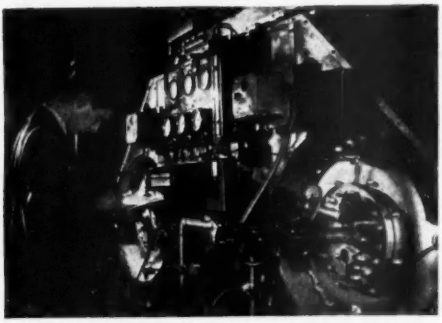
The set was designed to operate with an ambient air temperature of 68° F. After compression and passing through the combustion chambers, the design temperature for the h.p. turbine inlet was 1,160° F with a maximum per-

missible operating temperature of 1,200° F. Design speed for the compressor-h.p. turbine shaft is 5,750 r.p.m. and that for the l.p. turbine-alternator shaft is 3,000 r.p.m. Under these conditions the output was calculated as 1,200 b.h.p. at the turbine coupling with a fuel consumption of 850 lb/hr corresponding to a specific consumption of 0·7 lb/b.h.p./hr with an overall thermal efficiency of 20%.

Performance

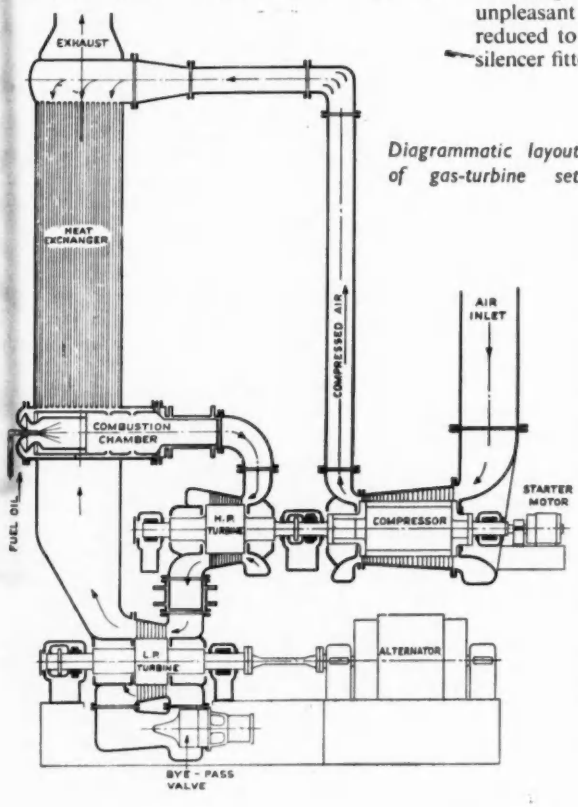
Last week we were privileged to examine this gas-turbine unit running under load in the test department at B.T.H., Rugby. The set had then completed a total running time of 528 hours: 193 hours using gas-oil as a fuel, and 335 hours using heavy oil having a viscosity of 1,500 seconds Redwood No. 1 at 100° F. Tests taken during this time showed that although the turbine inlet temperature at full load was about 50° F below the design temperature, the fuel consumption was about 10% less than the expected figure.

As, however, the set went on test "as designed" without any modifications based on experience, in appraising the performance, consideration must be given to the fact that neither the compressor nor the h.p. turbine are running at their best performance points. Further, the heat exchanger has a comparatively low heat recovery—having a thermal ratio of 50 to 52% only.



Combustion chambers and temperature gauges

During early testing, a high-pitched, rather unpleasant noise was experienced which was reduced to an acceptable level by means of a silencer fitted to the air intake.



Diagrammatic layout of gas-turbine set

Starting

The starting routine begins with the running up of the h.p. turbine-compressor shaft by means of a 50 h.p. motor. The l.p. by-pass valve is opened and at a speed of 1,200 r.p.m. the oil fuel is ignited electrically. The burners are then opened and the set begins to accelerate further under the combined aid of the h.p. turbine and the motor. The latter however has a characteristic which causes the torque to fall to zero at a speed of about 1,800 r.p.m. at which point it is automatically disconnected from the shaft.

During the starting cycle, a peak turbine-inlet temperature of 900°-1,000° F is attained but as the set accelerates towards the "idling" speed, this falls gradually to 652°-750° F dependent on the ambient conditions and the l.p. turbine speed. At "idling," the h.p. turbine speed is approximately 3,000 r.p.m., i.e. about half of full-speed.

Notes on Wiring
by MEGOHM

Statutory Instruments

"On What Compulsion must I, tell me that!"

I HAVE now had an opportunity of studying in detail the Cinematograph Regulations, 1950 (Statutory Instrument No. 2133, 1950), details of which were given in THE ELECTRICAL TIMES on February 1. They appear over the name of the Secretary of State for the Home Office, Mr. J. Chuter Ede, and are dated December 28, 1950.

As readers of this page may have noticed, I deprecate the modern tendency of delegated legislation primarily for the two good reasons that by this means full discussion by all interested parties does not always precede the making of a legally enforceable edict; and, unless one has the time, knowledge and opportunity for research in a suitably equipped library, it is difficult to know just where to search for the required information.

Most Acts of Parliament contain a clause to the effect that the Minister may make Regulations from time to time as he may think fit, and the present Regulations are thus made under the Cinematograph Act, 1909, which is quite logical. On the same principle, one would expect to find every Regulation in connection with the Electricity Acts to be made by the Minister of Fuel and Power by virtue of a similar clause in the Act which authorised Nationalisation. But it was never intended, nor do I think it possible that one of these S.I. Regulations should cancel any specific requirement of the principal Act itself.

Legal Loopholes

To the astute Parliamentarian, however, these small difficulties are there to be overcome, so that, to obtain a complete picture we must not omit a study of the Defence (General) Regulations, 1939, *et seq.* Extraordinary as it may appear to the layman, the Minister of Fuel and Power found it necessary in February, 1948, to rush through a "Relaxation of Obligations" order S.I. 223, 1948, by virtue of which electricity undertakers are no longer under any obligation to give a supply to any new consumer, increase the capacity of an existing supply, or supply any meter except in replacement of another of the same capacity.

This is a pretty drastic enactment, cutting right across the former obligation to the public, and it is difficult to see where the safety of the Realm in the year 1948 is affected. It emphasises, though, that we must be constantly on the alert if we wish to maintain that measure of freedom which was once our proud boast.

Returning to the Cinematograph Regulations, their obvious purpose is to safeguard the public in places of entertainment, and in the interests of simplification I should have been happier if they had been extended to cover all places of public entertainment.

At present various County Councils issue their own particular versions of what is deemed necessary, and, unfortunately, these ruesl vary from county to county. No doubt the present Regulations take precedence over lal local enactments, but that does not preclude the probability that they will be considered merely as minimum requirements, and that local authorities will continue to prescribe their own particular embellishments as in the past.

Compulsory Regulations

Perhaps the most significant provision in S.I. 2133 is the one that in general an installation shall conform to the I.E.E. Regulations. This is a step towards making these compulsory, and I noted that Mr. S. N. Watkins, vice-president of the E.C.A., expressed his hope for this at the recent golden jubilee dinner. He is also reported as appealing for a simplification of the Regulations, and I am pleased to find that on this latter point I am in such good company.

Regarding compulsory regulations generally, I am not so sure. The great stumbling block to my mind is the question of who should be the arbiter in the matter. Should we have a horde of Government inspectors? Would the electricity boards' officials be better? Registered contractors might form a pool, or an independent body could be set up.

Whatever method employed, I feel certain that the consumer would have to pay in the end, and I am equally certain that there would be no decrease in the cost of wiring work.

THE GAS ARC

Two years further research is summarised in IES paper by H. W. Cumming

RESULTS obtained with arc discharges in xenon, were first communicated to the Illuminating Engineering Society by DR. J. N. ALDINGTON, B.SC., PH.D., F.R.I.C., F.INST.P., in December 1948 and reported in our issue for Dec. 23 in that year. On Tuesday of last week, MR. H. W. CUMMING, B.SC., A.R.I.C., also of Siemens Research Laboratories, presented to the Society the results of further research in a paper entitled "The Extension of the Gas Arc Condition."

The term "Gas Arc" is now associated specifically with the original unit which Dr. Aldington then described. This, a water-cooled lamp of 5 kW loading emitted light of sunlight quality from an arc between tungsten electrodes burning in xenon.

Research work undertaken has resulted in the amassing of considerable information on both electrical and luminous characteristics of arcs in krypton, argon, neon, and helium in addition to xenon. It is, however, proposed here to confine ourselves to the xenon arc of which there are now three distinct types. The first, designated the XA/U, of which the original lamp is an example, is designed to constrict the arc by employing tubing of comparatively small bore, and utilises water cooling to dissipate the heat. Consumption is 5 kW, and the life of the order of 100 hours.

The second type of lamp, the XB/U, is rated at 1 kW and has been largely developed as a result of the original experimental work. Air cooling is utilised and the life is extended to some 500 hours. The third type utilises a construction generally similar to the well-known compact source mercury lamp, and has a power consumption of the order of 2 kW.

Approximate characteristics of the three types are given in the table.

Radiation from all three lamps is of sunlight quality with spectral distribution similar to those of a total radiator at approximately 6,000° K, and the output of the 5 kW lamp is about 150,000 lumens at full loading.

The xenon arc, in common with other gas arcs, has no "warm-up" period but can be switched in or out instantly, the preferred method of starting being by means of a high-frequency discharge at about 4 kV produced by a Tesla coil. The 2 kW compact source lamp is arranged with an auxiliary electrode so that it can be kept burning at reduced rate and flashed to normal brilliance for signalling purposes.

One disadvantage of the gas arc lamp is the low arc voltage, this applying particularly to the compact source type, making it inherently uneconomical for d.c. operation.

Peak brightness of the arc is exceedingly high, reaching values of upwards of 10,000 stilb. Higher brightness and higher luminous efficiency could be obtained with higher pressures, but it is considered that approximately two atmospheres is the practical limit for safety in handling since this lamp, unlike the mercury vapour type, does not build up its pressure in operation.

Applications

In addition to signalling, the practical applications envisaged are in situations where either high brightness or spectral quality are important. Colour photography, artificial fading of fabrics, and irradiation of plants during growth are some of the uses where the xenon arc may replace other forms of illumination. It also has an important application in infra-red photography where it is possible, by momentary overloading to obtain an output in the infra-red and near-infra-red region of up to nearly four times that of a tungsten lamp of equivalent nominal rating.

It is, however, stressed that research in the field of high-current arc discharges in inert gases is in its infancy still, and if the problem of higher pressures can be solved, many new applications will be practicable.

Type	5 kW XA/U (on a.c.)	1kW XB/U	2 kW Compact Source	
			Cont.	Flashed
Arc volts	65	45	21	23
Arc current ...	85	22-25	80	100
Lumens per watt...	25/30	22/25	—	—
Life	100 hrs.	500 hrs.	—	—
Arc length ...	65 mm.	85 mm.	10 mm.	10

Problems and Practice

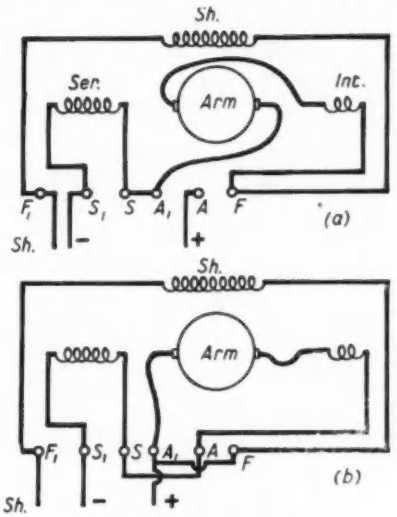
IN ENGINEERING

Open Circuit on Heating

RECENTLY a 70 h.p. 3-phase slip ring motor, 400 V, under my charge was found to stop when only a portion of the rotor resistance had been cut out. The rotor starting resistance and stator switch were housed in one compartment, and oil immersed. The starter was opened up, and each resistance tested for continuity, all connections and moving parts were checked, and the starter appeared perfectly in order. All phases tested and found correct, testing to earth and between phases. The motor and connections were thoroughly tested and found satisfactory. A further attempt at starting gave the same results. An intermittent open circuit in the rotor section was suspected. Each turn of the rotor resistances was again checked, and upon one turn a clean hair line crack, was found by probing although continuity test was satisfactory. I came to the conclusion that the slight increase in temperature when starting was sufficient to open the crack, thus giving rise to an open circuit, and on cooling would close sufficiently to give a satisfactory continuity test. This resistance was renewed, and the trouble eliminated.—*W. J. Woolcott.*

Easy—But Wrong

I WAS recently asked to investigate the cause of violent sparking which was taking place at the brushes of a 5 h.p. d.c. compound, inter-pole 400 V motor. The motor was new and had been installed for a short time in a textile mill. The motor was mounted on a wall bracket, driving two textile machines through a short length of line-shafting. It was at first difficult to understand why this trouble should have arisen in a new machine. The electrician who had installed the motor eventually mentioned that after he had installed the motor, he found that the motor ran in the wrong direction and he had reversed its rotation. The terminal box on the motor frame, I noticed, was between the motor and the adjacent wall, making access to the terminals very difficult, and it appeared necessary to unfasten the motor feet to allow the motor to be turned on the bracket to allow access to the terminal box. On mentioning this to the electrician he told me that he had not himself gone to that trouble, for he had merely made the change in connections at the commutator! This explained the cause of the sparking, for in reversing the armature leads he had reversed the direction of rotation, but had left the inter-pole circuit so that the inter-poles had the wrong polarity. This trouble well demonstrated the importance of leaving undisturbed the connecting lead between the inter-pole circuit and armature.



Reversing machine rotation

The incorrect method of reversal is shown in diagram (a) and the correct one in diagram (b) above.—*B. R. S.*

Undercutting Mica

REFERENCE has been made in these columns recently to mica undercutting on commutators.

The importance of this operation is not fully recognised, and the following points may be of use.

(1) It has been the writer's experience that the average maintenance man and repair shop make a very poor job of undercutting. (2) For small jobs an undercutting machine is essential to obtain a precision finish. (3) Many machines have been burnt out by bad under-

cutting or by the omission of this operation.

To be effective the mica must be *entirely* removed between the bars down to a predetermined depth. A shallow groove or V is useless as after a short run, it will leave projecting fins of mica on the sides of the bars and may lead to serious trouble eventually. Without a milling cutter of the correct width it is extremely difficult to remove the mica adequately. As far as depth is concerned it is better to cut too deep than too shallow. A deep V is recommended by some American makers but it is not the usual practice in this country.

Apart from machining technique, by far the most important question is whether to undercut or not. This can be a very difficult matter to decide as it depends on so many factors. Ignoring for a moment the basic considerations of brush grade, etc., and viewing the subject in a very broad manner, the writer has found that:

(1) Motor makers will sometimes vary the comm. treatment in a series of identical machines, either intentionally or accidentally. Hence it may be quite incorrect to follow the original. That is to say, a plain comm. should have been undercut or vice versa. In some machines it is of little consequence; in others, it is of vital importance.

(2) Certain types of machines give a guide to the comm. treatment. For example:

Low volt d.c. dynamo armatures (auto)	Always undercut
Low volt d.c. starters, small (auto)	Very seldom
Vacs., drills, portable tools ...	Always undercut
Small universal motors, e.g. 1/30 h.p.	Varies
Small (f.h.p.) d.c. motors (frig.) ...	Mostly plain
Larger d.c. motors	Usually undercut
Repulsion motors	Mostly undercut
Repulsion induction	Mostly undercut
Rep. start ind. run ("R.I.") ...	Mostly plain
Rep. start ind. brush riding ...	Mostly plain
Compensated repulsion	Always undercut

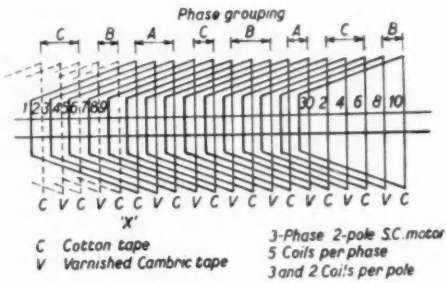
Thus it will be seen that there is no golden rule for undercutting and to a certain extent the wider the repairer's experience the less certain he may be as to the correct treatment in a particular case.

Finally there is a lot of misunderstanding as to the desirable commutator colour and texture, once the machine has been in operation long enough to mature the comm. surface. There is no standard in this respect. Some machines will develop the often admired purplish colour while others will be dark and pitted. One make of repulsion start induction run machine, under normal working conditions will develop a comm. surface more like carbon than anything else and yet operate perfectly well. Indeed, in such a motor it is impossible to obtain a "normal" polished surface. Moreover the commutator surface will vary in a group of identical machines, especially if the duty cycle varies for each motor; so much so that a machine on an unusual cycle may require a special brush.

A warning is required here. Do not experiment with brushes except as a last resource, and even then in consultation with the brush makers. There are over 2,000 different grades. —*Karl Wilkinson.*

S.C. Induction Motor Fault

A BREAKDOWN of the insulation between two coils of opposite phases occurred in the stator winding of a 2-pole, 3-phase, s.c. induction motor.


Phase grouping
C B A C B A C B
1 2 3 4 5 6 7 8 9
30 2 4 6 8 10
C V C V C C V C V C V C V C V C V C V C
'X'
C Cotton tape
V Varnished Cambric tape
3-Phase 2-pole S.C. motor
5 Coils per phase
3 and 2 Coils per pole

It was found that these two coils were insulated with cotton tape only, whilst the remaining coils were taped alternately with cotton and varnished cambric, thus ensuring adequate phase to phase insulation.

Further investigation disclosed an interesting point, which had been overlooked when the stator had been rewound.

The winding was of the single layer mush type, having 30 slots and 15 coils, 5 coils per phase and a pole grouping of 3 and 2 coils per pole. The core pitch was 1-12 inclusive.

The coils were taped alternately with cotton and varnished cambric tape, as the "bottoms" of the coils were inserted in the slots. Thus, the sides of the coil in No. 1 slot were cotton taped and those of the coil in No. 3 slot were varnished cambric taped, and so on. This is shown in the accompanying diagram. When the winding is closed by the coil "top" in No 10 slot, it will be seen that the coils nesting together are both taped with cotton tape, and that one coil is connected in a phase "a" group and the other in phase "b" as shown as "X".

This method of insulating the coils would appear to be in order when the number of coils is even, and this is probably the reason for its use by some repairers.—*A. C.*

Dimming Fluorescent Lamps

Balance must be struck between lamp stability and circuit simplicity

ADVANTAGES of fluorescent lamps in respect of their high efficiency have been offset for some applications by the difficulty of securing a good range of dimming. Fundamental principles underlying this problem, and methods of overcoming it in practice, are discussed in "The Dimming of Low-Pressure Discharge Lamps," a paper which MR. C. E. WILLIAMS, B.SC. (G.E.C.) presented to the I.E.E. Utilisation Section last Thursday.

Mr. Williams based his theoretical development on a consideration of a simple series circuit comprising lamps and resistor connected to a d.c. supply. Over a range of current a cold-cathode lamp has a characteristic of the general form shown in the diagram, though this is exaggerated for clearness. The chief features of the characteristic are a negative slope at higher lamp currents, a point of inflexion, a voltage maximum occurring at a lamp current of about 20 mA, and a positive slope at lower lamp currents.

Load Lines

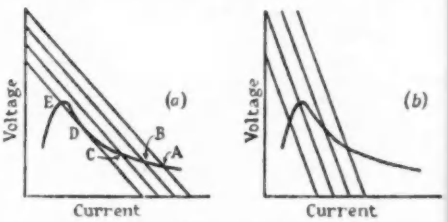
If operation with a given value of series resistance is considered, load lines for various voltage values may be drawn all having the same slope. For resistances giving a slope of less than a certain value, load lines may cut the lamp characteristic at more than one position, e.g. at D and E in the diagram. In the limiting case the resistance will be such that the load line is a tangential to the characteristic curve: then further reduction in voltage may produce either extinction of the lamp or sudden transfer to operating point E. The use of a higher value of series resistance, as in the diagram on the right, eliminates these multiple intersections, and the chance of undesirable sharp transitions of light output.

If the circuit voltage is kept constant but the ballast resistance is varied, then the slopes of the load lines will vary. With the voltage below a certain value, multiple intersection and a tangential condition is possible as above. With a sufficiently high value of voltage, this cannot occur. Thus there are two methods of dimming available, which may be called voltage control and impedance control respectively.

The nature of the lamp mechanism, with ionisation conditions determining instantaneous current-voltage relationships, complicates the discussion of operating conditions on a.c. Qualitative results may, however, be obtained from consideration of the r.m.s. voltage/current characteristic. The conditions of voltage and impedance control discussed above apply in general. For the resistor, an inductor may be substituted, and the load-line then becomes an ellipse, the semi-axis along the abscissa representing the current that would flow through the inductor if the circuit voltage were applied directly to it.

Practical Dimming

Most practical circuits combine voltage and impedance control. Consider several cold-cathode lamps with their associated transformers in parallel, all fed from a potentiometer. This type of dimming is essentially voltage control, and gives only a small (perhaps 10 : 1) ratio, but is cheap in first cost. Connecting a variable resistor in series with each separate transformer gives impedance dimming, with the possibility of a 700 : 1 ratio without flickering. Much the same result can be



Load lines and lamp characteristic for successive stages of voltage control dimming

obtained with transductors (variable d.c. saturable inductors) in each transformer circuit. With these circuits the limit is set by the extent to which voltage control occurs. This depends on the transformer magnetising current, and units with a low value of this characteristic are desirable.

An alternative method of transductor control has all the transformer primaries in series, and the transductor completing the series circuit.

Hot cathode circuits may be controlled by similar methods, though a separate control unit (resistor or transductor) is required for each lamp because of starting considerations.

Size is an important factor in determining the relative merit of the schemes described. With the resistor system, the need to gang together a large number of resistor controls, and then to run the corresponding control cables, may be prohibitive. Where transductors are used, control may be obtained from a single dimmer, and if electronic control is applied, a single hand-operated potentiometer of a few watts rating may suffice. The h.v. cold cathode lamp is best adapted to resistance dimming, since several tubes may be connected in series and controlled by one resistor. Where this method is used, it is normal to supply each lamp with its own inductive ballast. From the power loss point of view, the resistor method is preferable only if the lamps are to be run for long periods at full brightness. Transductors, in addition to their obvious advantages, have the added merit of inducing a very sudden reversal of current, with the result that lower circuit voltages are permissible without risk of lamp extinction.

Dimming of hot cathode lamps is complicated by the need for supplying supplementary filament heating current at low values of discharge current, while at the same time avoiding overloading of the filament at full brightness. Various circuits have been evolved to obtain this variation.

Power factor correction with varying inductance is troublesome, but may sometimes be achieved by switching in or out blocks of capacitors at given points in the dimming range. With transductor control, the parallel combination of a large transductor and a capacitor arranged to give u.p.f. at maximum lamp currents has many advantages. Direct connection of capacitors in lamp circuits is not very satisfactory.

Extreme Dimming

For ranges of dimming up to a ratio of 600 : 1, the main factors are discussed above. The chief difficulties are the avoidance of flicker, the reliable starting of the lamps, and the maintenance of even brightness throughout the installation. Under heavily dimmed conditions, however, new factors become important, many of which are not well understood. For instance, when very low currents pass through a lamp, its impedance is correspondingly great, and any shunt capacitance can produce a considerable effect. With the long tubes used for cold-cathode lighting, this can even produce noticeable differences of brightness in various parts of the lamp itself.

Another difficulty arises because of the inconsistency of performance of a given lamp. Temperature and humidity conditions appear to cause changes in performance, which may be associated with surface moisture films and consequent variations in surface resistance.

DISCUSSION

Mr. H. R. RUFF (B.T.H.) said that the additional complexity of the fluorescent lamp dimming gear involved greater cost, which must be borne in mind when considering schemes for the use of fluorescent or incandescent lamps, but where the fluorescent lamp could be wisely applied—where the lamps were often at full brilliance, but had to be dimmed occasionally—the dimming schemes described in the paper would be a useful tool for lighting engineers.

The main problem was the simplification of the bulk control of fluorescent lamps. Recent work by B.T.H. had led to a field trial of a system with hot-cathode lamps, in which, by using transformers as impedances, they had managed to dim from one common resistor-dimmer on a straight a.c. circuit up to 18 lamps, the control being taken down to about 0·5% light output by compensating for the magnetising current in the transformers.

Dr. J. W. STRANGE (Thorn Electrical Industries) suggested that economics dominated the development which had been described. The House of Commons installation was interesting, but there, presumably, expense did not matter. In buildings such as theatres, however, competition was encountered from well-established methods. The cold-cathode lamp was ruled out by the high voltage required, and hot-cathode mains-operated lamps were the only answer.

Mr. S. ANDERSON (G.E.C.) said that the fluorescent lamp had come to stay, and it would be a pity to have to revert to the older light-source whenever it was desired to vary the intensity of the light smoothly. Moreover, there were advantages in the characteristics of fluorescent lamps, not the least of which was the maintenance of a relatively constant colour of the light output at all stages of dimming.

Mr. A. G. RAMSEY said that in some cases it might be necessary to maintain an illumination within the dimming range, which might mean continuously-rated instead of intermittently-rated dimmers.

Mr. F. B. B. WINTER (Major Equipment Co.) did not see much application for the cold-cathode lamp for theatre lighting, but said that the hot-cathode could be used for lighting cycloramas and backcloths for the variety and music-hall stage in particular.

Mr. A. N. IRENS (chairman of the Utilisation Section) said that it was a very good thing that so many people in different laboratories were all trying to achieve the same objective, because there were so many possible final solutions that it was appalling to think of some planner coming along and saying, "This is a waste of effort, and we should have one laboratory only."

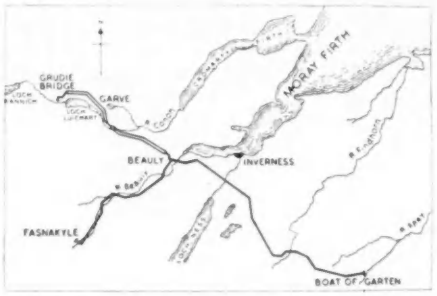
The AUTHOR replied briefly.

Transmission in Scotland

Rugged country presents many erection problems

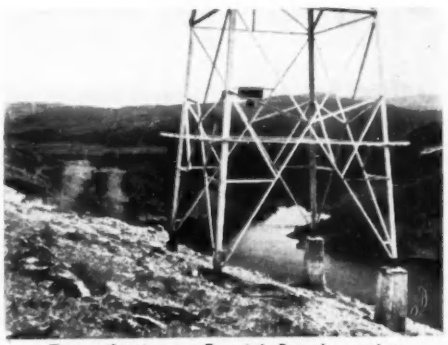
WE are not accustomed, in Great Britain, to regard the erection of 132 kV transmission lines as anything calling for special comment. Nevertheless, a contract recently undertaken by W. T. Henley's Telegraph Works Co. Ltd., for the North of Scotland Hydro-Electric Board involved installation work in such rugged and inaccessible regions that it presented a number of unusual features.

The contract comprised the erection of some seventy-four miles of steel tower line between Grudie Bridge power station (which is fed by pipe-line from Loch Fannich) and Boat of Garten. As will be seen from the accompanying

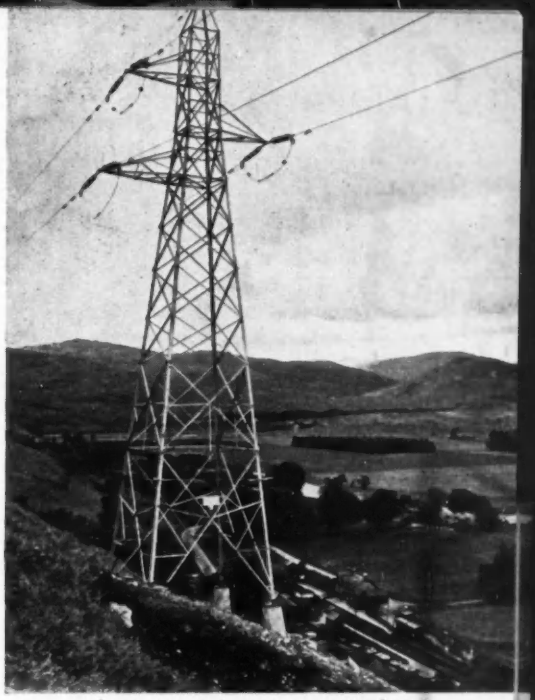


map, this line runs via Beauly substation where it is joined by a line from Fasnakyle to Beauly which is approximately sixteen miles in length.

For about sixteen miles between Grudie Bridge and Beauly the system is split into twin single circuit lines running parallel at a distance of about 150 ft. apart. This was done in order



Tower footing on Fannich-Beauly section



Single circuit tower overlooking Garve

to minimise the effect of possible interference from lightning storms which are prevalent over this section of the route. The remainder of the line is of double circuit construction.

Construction

Because of the very wild and rugged terrain over which most of the ninety miles of line had to be erected an unusually wide range of types of towers were installed. The problem was further complicated by the remoteness and inaccessibility of many of the tower sites. Various forms of transport, including Fordson and D4 type caterpillar tractors, power winches, mules, aerial ropeways and an improvised funicular railway, were used to haul foundation materials, tower steelwork, conductors and accessories over the mountainous country. At the most inaccessible positions these materials had to be manhandled.

In addition, pneumatic compressors, concrete mixers, power pumps and other heavy plant were manoeuvred into position for installation of the foundations, in which solid rock, peat and running sand were encountered in considerable quantities. These and the predominance of hillside slopes in many instances involved the design of special foundations.

The consultants on this contract were Messrs. Kennedy and Donkin. We are indebted to the North of Scotland Hydro-Electric Board for permission to publish these notes.

Safety on the Job

The Supervising Engineers' Responsibility Discussed

ACCIDENTS and the supervising electrical engineers' responsibility for their avoidance received expert attention at a London meeting of the A.S.E.E. on Tuesday, when Mr. H. MIDGLEY, M.SC., M.I.E.E., M.A.I.E.E. (Chief Safety Officer, B.E.A.) lectured on the subject. Responsibility under the Factory Acts was first dealt with, emphasis being placed on the factory occupier's duty to protect employees even from the consequences of their own unthinking actions—plant and equipment must be safe almost to the extent of being foolproof. Proceedings can be taken against an occupier for contravention of the Act, even though there has been no accident.

The employee himself is required to make proper use of safety appliances and procedures provided, and if he does not do so he is liable to prosecution. Where contractors are working in a factory, the normal occupier is responsible in particular for providing safe means of access to their place of work. If a contractor is working in a part of the factory where the normal factory process is in operation, he is responsible for the safety of his own employees if he is carrying out work to which the building regulations apply. If he is on other work, the normal occupier may be responsible.

Electrical Safety

If an analysis is made of reportable electrical accidents over the years 1944-1948, it is clear that portable appliances are the greatest single source of accidents. They account for 28·8% of all types of accidents, and for 35·7% of fatal accidents. Switchgear, both above and below 650 V, and crane trolleys also show high percentages. The three classes together account for some two-thirds of all electrical accidents.

Of all types of electrical portable machines, the high frequency design has by far the best records of safety. This is due to the use of squirrel cage rotors, which eliminates trouble with the armature and commutator, and to the necessary inclusion of a motor generator in their circuit, which facilitates the adoption of a low operating voltage. The universal type is as safe when new, but may be less so after the rough usage to which it is liable to be subjected. Carefully supervised maintenance, with the results systematically recorded on a card index, gives a good chance of safe and efficient service being obtained. A check for the continuity and good condition of the earth conductor is probably the most important test to be applied.

Regular testing of the earth connections of all socket outlets should also be part of routine maintenance. In addition, the various methods of providing a continuous automatic check on the safe condition of apparatus deserve consideration. The other recommended method of securing relatively safe operation is to run the portable tools at a low voltage, 110 V with centre tap earthed being suitable.

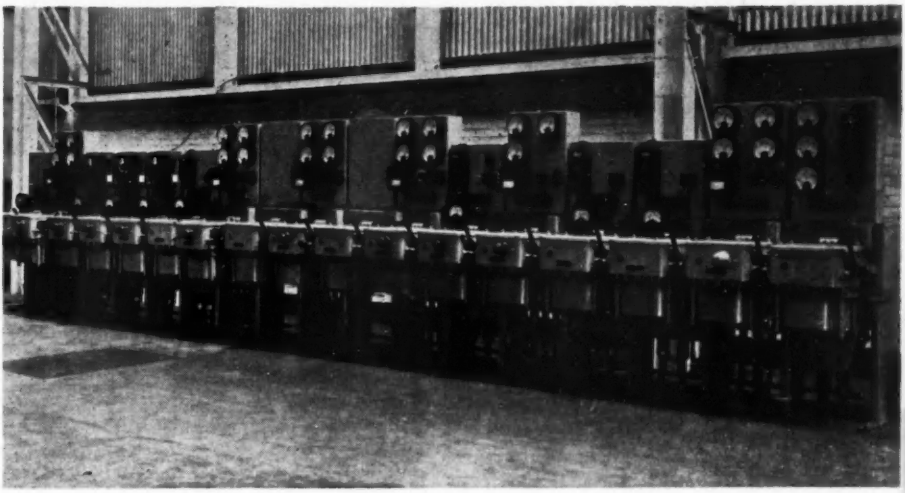
Switchgear

Many accidents occur while preparing h.v. switchgear for work, and as a result of such preparation being incorrect. Careful drawing-out of circuits in the form of a single line diagram should be the first step in the preparation of instructions for any item of work. The various switching and isolating operations should then be listed in proper sequence. Before earthing any h.v. conductor by hand, a potential indicator should be applied to prove that the conductor is dead. Care is particularly necessary in cleaning spout orifices on metal-clad gear, as accidents during such work are not uncommon.

So far as lower voltage switchgear is concerned, accidents commonly arise from the tendency of electricians to disregard the shock risk of medium voltage circuits. The rule should be "do it dead"; jointers may work successfully and safely on medium voltage cables, but they possess more than the average skill. Where access to live control gear is necessary for maintenance purposes, it is best to arrange the equipment as an open type switchboard, and to comply with the relevant regulations.

Non-electrical Accidents

Electrical accidents comprise only 0·4% of the total number of reportable accidents listed by H.M. Chief Inspector of Factories, although they make up 4% of the fatal group. Since electrical staff sustain their due proportion of all other classifications, the supervising electrical engineer must not confine his attention to purely electrical aspects of safety. Power machinery is responsible for 16% of all accidents, and other notable causes are the use of hand tools, injury by falling bodies, persons falling, stepping on or striking against obstacles and handling goods or articles. This group is responsible for 69% of total accidents and for 50% of the fatal accidents.



Progress in Production

Steady flow maintained in output of switchgear for both large and small installations

No. 7. Ferguson Pailin Ltd. and Hoover Ltd.

TO meet the ever-increasing and urgent demand for switchgear of all sizes from generation and primary transmission switchboards down to the smaller gear installed in consumers' substations, a steady flow has been maintained from the Higher Openshaw Works of Ferguson Pailin Ltd. for both large and small installations.

At Bromborough power station of the Merseyside and North Wales Division a 12-switch 132 kV 2,500 MVA substation has been commissioned. Site work is being carried out on a 132 kV 2,500 MVA grid substation at Hinksford where F.P. have also supplied and commissioned during the past year both the 33 kV, 500 MVA and 7 kV 2-phase switchgear.

At Barrow Main, the first 132 kV 1,500 MVA substation of the Ex-Central Electricity Board to be equipped with air-blast switchgear, extensions are being carried out and the switchgear is at present in course of manufacture. 132 kV 2,500 MVA air blast switchgear is also in production for the Carmarthen Bay power station of the South Wales Division.

The photograph above shows the type "K" switchboard at Rogerstone Works of the Northern Aluminium Co. Ltd.

The equipment is in hand for a complete 132 kV outdoor switching station at Barrow Roosecote, comprising nine 2,500 MVA type XOPR.54 bulk oil circuit breakers to control the output from the solidly coupled 11/132 kV generator transformers in the adjacent power station.

33 kV Equipment

A number of 33 kV outdoor substations involving oil circuit breakers of varying capacities from 350 MVA to 750 MVA are also in hand, including a six-switch station with type TTPO.24/3 oil circuit breakers for Sowerby Bridge, and an eight-switch station with type ROP.32 oil circuit breakers for Penrith and an 11-switch station with type ROP.32 oil circuit breakers for Redhouse, to mention only a few.

Power station main and auxiliary switchgear has also been prominent in last year's programme. The installation of two 30-panel and one 22-panel auxiliary boards is proceeding at the Bankside power station of the London

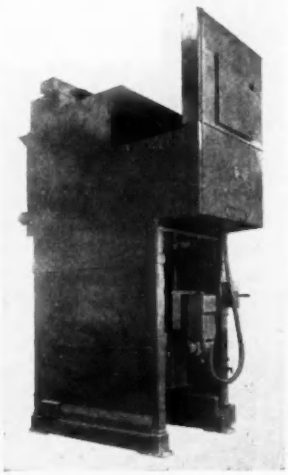
Division, together with extensions to the 33 kV type VTRP.32 generation and distribution switchboards at Kingston-upon-Thames Power Station. A 33 kV, 750 MVA 10-panel type VTLP.10 duplicate busbar transfer breaker switchboard is in production for the East Yelland Power Station of the South-Western Division, whilst for lower voltage generation a new 6·6 kV 250 MVA 9-panel switchboard, complete with remote control facilities has been ordered by the Slough Trading Estates Ltd. This board will replace the existing switchgear and also cater for the extensions which are at present taking place.

Equipment for numerous substations has been supplied, including over thirty 22 kV 350 MVA units for North Hyde, 14 for Southall, and 14 for the North Thames Gas Board.

Industrial Equipment

In the 11 kV and 6·6 kV range a notable installation completed during 1950 is that at the Stanlow Plant of the Shell Refining and Marketing Co., Ltd., where the commissioning of 60 of the ever-popular type BV units has contributed towards getting this new factory in production. Two other large switchboards, one of which comprises over 20 units, are at present being built for the South-Eastern Electricity Board.

In the industrial field the production of 400 V switchgear of the types K and KC has been fully maintained, a notable order comprising 32 type K4/5 units for the new Rolling Mill at Rogerstone, South Wales, of the Northern Aluminium Co.



This illustration shows a type VTLP.10 unit for 33kV

Export

Production of many types and ratings of F.P. switchgear for both indoor and outdoor service for export has been maintained at a high level throughout the year.

Among the Commonwealth territories, India is notable where, for the Damodar Valley Corporation production is proceeding on 21 132 kV 2,500 MVA outdoor bulk oil circuit breakers. Other contributions of interest for this territory include equipment for six outdoor 22 kV substations for the Government of Bombay. Further, a number of outdoor 33 kV, 500 MVA type ROP.32 and 66 kV, 500 MVA type ROP.54 oil circuit breakers, together with substantial quantities of the well-known type BV air insulated metalclad switchgear are in hand, or have been completed, for various Provincial Governments and industrial consumers in India.

High Voltage Indoor Gear

In the high voltage indoor metalclad field, additional equipment comprising 12 type VSRP.32/36 20 kV 750 MVA units is in course of construction. This gear is to equip two substations for the City of Johannesburg, South Africa. Further orders have been received, and steady delivery progress has been maintained in connection with indoor cellular mounting type RP.28/3, RP.28 and RP.32 oil circuit breakers having ratings from 20 to 40 kV up to 740 -VA, primarily for the Rand and Anglo American undertakings.

The modernistic streamlining tendency in design has been acknowledged by Australia, and is illustrated by orders totalling over 250 flush-fronted BV units (type FBV), delivery of which will shortly commence; these will be installed by the S.E.C. Victoria for the Morwell and Yallourn schemes, also by Melbourne C.C.

Hoover Ltd.

In 1950, two new Hoover cleaners were introduced, the heavy duty cleaner for hotels, shops, cinemas and other large buildings; and the "Junior" 119 cleaner for the smaller home. The output of washing machines continued to grow, 60% going for export while the remaining 40% provided a most popular machine on the home market.

Early in the year, a range of fractional horse-power motors was introduced, new in all design details, and, in another sphere, the development of a new moulded type of commutator not only aided the manufacture of Hoover products, but created a business of its own, some 60% of the output going to America.

Stud Welding Progresses

Nelson stud welding gun produced by Crompton Parkinson Limited speeds work on Festival Site and on Britain's new power stations

THE advantages claimed for stud-welding, when it was first introduced generally by the development of the Nelson gun, made by Crompton Parkinson, have been amply substantiated over the past few years. During this period, the technique has been consolidated, and the range of application enlarged. As can be seen from the photographs, the tool is most versatile in its use, and the range of items which can be welded has been greatly extended.

Although the original purpose of the tool was the fixing of wooden planks to the steel decks of aircraft carriers, it can now be used for a wide variety of tasks. In the electrical industry, such items as the fixing of studs for terminal boxes, transformer covers, and conduit supports spring readily to mind.

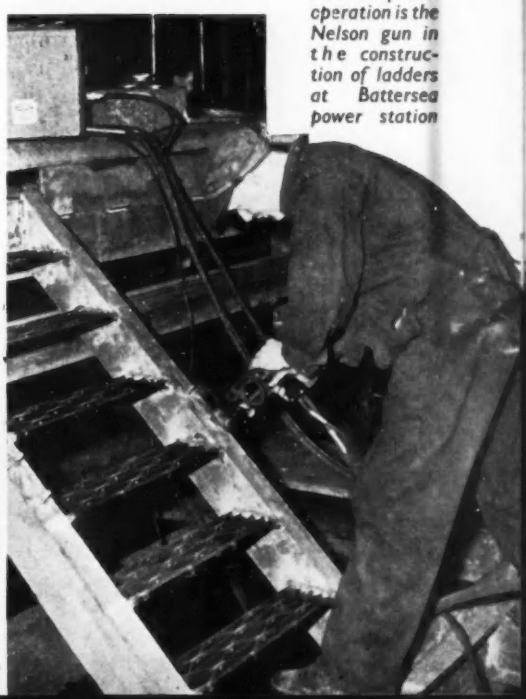
The introduction of two new rectifier units utilising selenium metal rectifiers in lieu of the motor-generator sets normally used for stud welding has decided technical and economic advantages. These units are the U1 giving a maximum welding current up to 2,000 amps for studs up to and including ¾ in. dia., and the U2 with a current output of 1,250 amps for studs up to and including ½ in. dia. The power consumption when not welding is low—4 kVA for the U1 and 1·5 kVA for the U2. Both units may be operated on any normal mains voltage from 340-440, three-phase, at frequencies from 40 to 100 c/s. For heavy working, any number of units may be paralleled without load sharing problems.

Using these units, the Nelson gun welds studs from ⅛ in. to ¾ in. dia. at the rate of 150 to 300 per hour, according to stud size and application. Semi-skilled operators can easily achieve rapid and consistently good welding and, owing to the light-weight construction and ease of operation, the tool can readily be used in confined or restricted spaces.

Details of the use, construction and application of the Nelson stud-welding gun may be obtained on application to Crompton Parkinson Ltd., Crompton House, Aldwych, London.

Workmen, seen above, welding the supporting side studs on a Festival of Britain exhibition structure. Below, an operator is seen working on a dust collector component for a power station

A welder shows how simple in operation is the Nelson gun in the construction of ladders at Battersea power station



overseas news

New Station for Brisbane

The City Electric Light Co., of Brisbane, is to immediately put in hand the construction of a new 10,000 kW power station, which will be situated close to the Ipswich coalfield. Cooling water will be drawn from the Bremer River. This station will be necessary to combat threatened power shortages to south-east Queensland. Apparently orders for the necessary equipment have already been placed with American firms, for the company plans to have the new station in operation before the winter of 1952. The Acting Mines Minister, Mr. Jones, has said that the Government is determined that Brisbane should not suffer blackouts similar to those now occurring in Sydney. The new powerhouse is the latest move in the race between soaring consumption and output over the south-east Queensland electricity network, for the demand is now dangerously close to the total capacity of Brisbane's two existing powerhouses. Need for the new Ipswich powerhouse was caused by delay in delivery of vital equipment for the new City Electric Light Co.'s Bulimba "B" station now under construction, and factors beyond the control of Queensland authorities had caused unforeseeable delays, he said. The State Government has approached the Commonwealth for the necessary dollar allocation on the recommendation of the State Electricity Commissioner. Mr. A. McCulloch, chief engineer of the City Electric Light Co., has said that the higher capital cost of the American equipment would be offset by having the new station in the mines area, thus saving on transport costs.

Another Loan

The State Electricity Commission of Victoria a few days ago launched a new £6,000,000 twelve-year loan, interest being at £3 7s. 6d. per cent. This is the fifth Kiewa-Morwell loan, and the largest yet raised by the Commission.

Victoria's Deficit

An increase of 9% in units sold was recorded by the State Electricity Commission of Victoria for the year to June 30 last, the total being 1,880 million. The number of consumers connected—18,870—was also a record, bringing that total to 523,500, of which 391,000 are in the Commission's retail area of supply. Generating capacity was increased to 508,465 kW by the end of the year covered by the report. The year's working resulted in a deficit of £349,368, as we have already recorded, and it is stated that with increases in wages and the continued upward trend in costs, the higher electricity tariffs introduced last July will be inadequate, and further increases will be necessary.

Troubles in Victoria

Coupled with power restrictions which the Government has approved, the State Electricity Commission of Victoria has appealed to all consumers to reduce their consumption by 12½% each day throughout 1951. Under the restrictions, the overall consumption of electricity by domestic and commercial users in any quarter is not to exceed the amount used during the corresponding quarter last year. Next quarter's quota will be shown on each consumer's bill for the previous quarter as soon as this can be arranged by the Commission. The restrictions include: no electric radiators between 7.30 a.m. and 5.30 p.m., and shop window and display lighting is permitted only between 6 p.m. and 11 p.m. Mr. Hunt, chairman of the Commission, has said the restrictions were due principally to the reduction of output at Yallourn power station. The boilers at Yallourn had for some years been operated on an overload basis, and it had now been found necessary to limit the output of steam from them to something nearer their proper rating. In addition, Yallourn has struck a patch of inferior coal, the faults of which were not apparent until it went into the boilers, but which has reduced power output there. There is no prospect of getting out of this bad patch for a year. A similar position arose at Newport power station because of the difficulty of burning widely different types of fuel—briquettes, raw brown coal and oil, and Indian and South African black coal. The Richmond power station had to be withdrawn from service to allow the new generation plant there to be erected for the winter load. The situation had been affected also by the necessity for plant to be taken down for summer overhaul.

Expansion in Quebec

The Northern Quebec Power Co.'s 34,500 h.p. extension to its Quinze River power plant is expected to be in operation by the end of March. When finished, it will raise the total generating capacity of the company (which is a subsidiary of Canada Northern Power Corp.) to 84,500 h.p. For some time now, Northern Quebec Power Co. has been buying power from Quebec Hydro to augment its own supplies but, with the new unit, it is expected that these purchases will be cut.

New Niagara Station

Preliminary work has commenced at the new 600,000 h.p. Sir Adam Beck-Niagara Generating Station No. 2 of the Hydro-Electric Power Commission of Ontario. The new development, which will cost approximately $157,000,000, at present-day prices of materials and labour, will be located in close proximity to the present Sir Adam Beck station (formerly known as the Queenston plant.)

An order for the six water turbines has already been placed, as we noted last week, and the Canadian Westinghouse Co. is to supply three of the six 80,000 kVA generators. Every effort is to be made to have the project in operation by 1954, depending on the availability of adequate supplies of materials and labour.

An Urgent Need

The lack of facilities for testing high voltage equipment was criticised by Mr. F. L. Lawton, vice-president of the Canadian Electrical Association, at a convention in Ontario a few days ago. He emphasised that, although a leader in electrical output, Canada was woefully short of technical developments in the electrical field. In regard to h.v. equipment, such plant made in Canada had to be sent to the U.S.A. for tests, with a resultant increase in costs. The association, he said, has a committee working on recommendations for a central testing laboratory in Canada. This would tend to bring down the price of high voltage equipment and encourage young Canadian engineers to remain in the Dominion.

Damodar Scheme

It is authoritatively stated that the original estimate of the cost of the Damodar Valley Project which was £41·25 million, has now gone up by about 60%. The increase has been due partly to devaluation, partly to an increase in the price of materials and wages since 1946, and partly to an increase in the scope and nature of the work itself. For instance, it had been planned to construct 125 miles of transmission lines from the Bokaro thermal plant, but these have now been extended to 475 miles. The budget for 1951-52 provided for an expenditure of about £10 million, of which just over one-third would be dollar expenditure, which is covered by the loan from the International Bank. About 70% of the total budget provision will be spent on the Bokaro thermal power station and its transmission system.

New Zealand to Electrify Railways

The New Zealand Government has approved the proposals to electrify the North Island Main Trunk Railway, it has been announced. The first section to be tackled—from Auckland to Frankton Junction—should be completed by March, 1955, according to present plans. It is estimated that the conversion to electricity will save about £900,000 annually and reduce the importation of coal and fuel oil by 50,000 and 70,000 tons respectively, Mr. W. S. Gooseman, Minister of Railways, has stated.

Tekapo Nearly Ready

The Lake Tekapo hydro-electric project, New Zealand, is advancing rapidly toward completion, and it is hoped that the station will be operating toward the end of the winter, giving an additional 25,000 kW to the South Island power network. Most of the civil constructional works have been completed. The powerhouse itself has much of the scaffolding removed and engineers of the State Hydro-Electric Department have begun to install the generating equipment. The penstock from the surge chamber to the generator room is in place and the tail race beyond the station is ready.

New Station's Progress

Considerable progress has been made with the construction of the new Pietersburg power station, being erected at a cost of about £180,000. The power station, which will be the third largest in the Transvaal, is expected to be completed by about August or September. The incorporation in a riddling hopper of an idea of Mr. J. Inglis, the town's electrical engineer, will result in a saving of about 5% in coal, it is stated. The council is also negotiating to supply electricity to other outlying areas.

Plans for the Congo

Considerable industrial expansion is planned for the Belgian Congo, and many new power schemes are projected. The latest of these, for a hydro-electric station with a capacity of 31,000 h.p., at Costermansville, was recently announced by the president of Regideso. This station should be in operation by 1955. On another project, for a power station at Tshopo Falls, Stanleyville, work is expected to begin in June next, and completed early in 1954. A 2,000 h.p. station is also to be erected on the River Uele in the Dingila branch of Cotonco.

Expansion

A recommendation by the Escourt Council electricity sub-committee, Natal, to buy additional electrical plant and more equipment for the main substation, was adopted at the last meeting of the Town Council. The new equipment is needed to cope with the big increase in consumption.

Plant Wanted

At a ratepayers' meeting in the Brandfort Town Hall, Orange Free State, recently, it was unanimously decided to authorise the Town Council to raise a loan of £25,000, to be used to improve the town's electrical system.

Avoid Power Cuts

The recent request of Mr. A. M. Jacobs, chairman of the Electricity Supply Commission of South Africa, for a 10% reduction in power demands of all consumers on the Rand, has caused some consternation, apparently, but the gold mining industry considers that its existing arrangements will prevent any serious interruption in that sphere. It is pointed out that during the past two years the gold-mining industry has had to accept cuts of power at peak periods, but has been able to arrange its operations by staggering such work as hoisting, in order that these cuts did not interfere with gold output.

The effects of the cuts are expected to be felt more severely in the industrial areas of the Reef towns, particularly in the East Rand.

PERSONALITIES

IN THE INDUSTRY

A well-known figure in power supply circles, **Mr. E. F. Hall,** A.M.I.E.E., is to retire from the position of station superintendent at Brimsdown generating station, Eastern Division of the B.E.A., at the end of March, when he will be succeeded by **Mr. J. Newton,** A.M.I.Mech.E., A.M.Inst.F., as we noted last week. Mr. Hall has spent 41 years with what was the old Northmet Power Co., wholly in their two power stations at Taylors Lane and Brimsdown. During that lengthy period he has held most of the positions there are in a power station. Before joining the Northmet, he was for a time in the substations of the Willesden U.D.C., after having served an apprenticeship with a firm of engineers in Clapham. We join with Mr. Newton's many friends in the industry in wishing him continued good health and a long and happy retirement.

Mr. E. F. Hall

Mr. T. G. Evans, who has been appointed district manager at the Newcastle-on-Tyne office of Brookhirst Switchgear Ltd., has been assistant to Mr. H. H. Renfree, the firm's district manager at Leeds.

Until recently publicity manager with Babcock and Wilcox Ltd. **Mr. J. O. Twinberrow,** A.M.Inst.C.E., M.Amer.S.M.E., was entertained to luncheon a short time ago by the Publicity Committee of B.E.A.M.A. He had been a member of that committee from 1945, until his retirement, and was its chairman in 1945-46. At the luncheon the chairman, **Mr. D. G. Denoon,** on behalf of the committee, presented Mr. Twinberrow with a pair of field glasses as a memento of his long and happy association with them.

Mr. T. E. Wilkinson, A.M.I.E.E., has been appointed deputy station superintendent at the new Croydon "B" power station. He was formerly technical representative at Fulham generating station, and is succeeded in the latter position by **Mr. T. Davis.**

Mr. R. H. Watts has resigned from the board of Hilger and Watts Ltd. **Mr. A. H. Campbell,** M.A., A.M.I.E.E., has been co-opted to fill the vacancy.

The Minister of Transport has announced that **Mr. F. A. Pope** is to become a full-time member of the British Transport Commission. Mr. Pope is chairman of Ulster Transport Authority.

Following the recent retirement of **Mr. P. J. Wardle,** A.M.I.E.E., from the post of district manager at Cannock, to the Midlands Electricity Board, **Mr. H. B. Croft,** A.M.I.E.E., has been nominated to succeed him. Mr. Croft's position of district engineer at Cannock is taken over by **Mr. L. R. Ryder,** A.M.I.E.E. In the Board's Congleton District, **Mr. C. R. Lovatt,** A.M.I.E.E., is now district engineer, with **Mr. G. Waterhouse** as district consumer's engineer. In addition, the positions of consumer's engineer for the Shrewsbury district and Walsall District are now held by **Mr. A. J. Leather,** Assoc.I.E.E., and **Mr. A. E. Forrest,** Assoc.I.E.E., respectively.

The new station superintendent at Grove Road power station, London Division, B.E.A., is **Mr. W. A. Rollo,** who has been chief assistant there since 1946. He joined the former London Power Co. in 1926, and occupied several staff positions at Deptford West and Acton Lane stations, in addition to Grove Road. Another appointment in the Division is that of **Mr. T. H. Watson** as superintendent at Islington power station, in succession to **Mr. L. B. Dent,** whose retirement we have already noted. Mr. Watson was formerly the deputy station superintendent there, having had experience at Neasden power station before going to Islington in 1924, originally as assistant charge engineer.

An interesting ceremony took place recently at the annual dance of Ashley Accessories, Ltd.; **Mr. J. C. M. Foxcroft,** who joined the firm at their works, which was then in Liverpool, as their works manager, twenty-five years ago, and is now works director, was presented with a grandmother clock in appreciation of his quarter century of service. Managing director, **Mr. E. T. White,** who was accompanied by Mrs. White, made the presentation.

Mr. J. C. M. Foxcroft receives congratulations

At present manager of No. 2 sub-area (Huddersfield) of the Yorkshire Electricity Board, **Mr. F. A. Ellis,** M.I.E.E., M.I.Mech.E., M.Inst.F., has been appointed sub-area manager (designate) of No. 2 (Newbury) sub-area of the Southern Electricity Board, with effect from July 1. Upon the retirement on January 31, 1952, of **Col. Fraser,** M.C., T.D., M.I.E.E., Mr. Ellis will assume the duties and responsibilities of the post of sub-area manager. Mr. Ellis was borough electrical engineer and manager at Huddersfield from January, 1944 until vesting day, after being deputy chief for nearly five years. From 1936 to May, 1939 he was personal assistant to the managing director of the Yorkshire Electric Power Co. His early training was gained with C. A. Parsons and Co., Ltd., and Hereford Corporation, and, after war service, he became a partner in Arthur Ellis and Partners in 1921. He has also served as deputy chairman of the E.D.A. Executive Committee for Yorkshire, and as a member of the I.E.E. North Midland Centre Committee.

Mr. F. A. Ellis

At the beginning of next month, **Mr. J. H. Jones,** Assoc.I.E.E., Assoc.I.B.A.E., takes up duties as branch manager with the South Western Electricity Board at St. Ives, Cornwall. He is at present district refrigeration sales engineer, Melksham, No. 2 sub-area of the Southern Electricity Board.

Mr. J. H. Gibson, director and chief engineer of Dewrance and Co., Ltd., is leaving for Australia tomorrow, February 23, in connection with contracts recently placed with the company. His headquarters, during his six weeks visit, will be c/o Messrs. Austral Engineering Supplies (Pty.), Ltd., 490-492 Kent Street, Sydney. Mr. Gibson will be returning via America to renew contact with American associates.

Siemens Brothers and Co., Ltd. announce the appointment of **General Sir Hubert de la Poer Gough,** G.C.B., G.C.M.G., K.C.V.O., as chairman of the Company and the **Earl of Gowrie,** V.C., P.C., G.C.M.G., C.B., D.S.O., as vice-chairman. In addition, **Mr. F. A. Lawson,** B.Eng., A.M.I.E.E., has been appointed managing director in succession to the late Dr. Henry Wright.

Mr. F. A. Lawson

Mr. Lawson graduated at the University of Liverpool and after spending some time at the Technical University at Karlsruhe, entered the Alternating Current Department of Siemens Brothers Dynamo Works at Stafford in 1909. He was transferred in 1911 to the Caxton House staff, working under the late Sir George (then Mr.) Hume on the patents side. He served in the Army from 1914 and was seconded in 1917 to the Admiralty for work at Liverpool and Greenock on detection of submarines. He returned to Siemens in 1919 and in later years became concerned with the executive side of the Company's business, joining the boards of various subsidiary companies. He is a director of Caxton Electric Developments Ltd., Siemens Electric Lamps and Supplies Ltd., Alfred Graham and Co., Ltd. He is also a director of The Siemens and General Electric Railway Signal Co., Ltd., and chairman of Submarine Cables Ltd. He joined the board of Siemens Brothers and Co., Ltd., in 1946.

OBITUARY

We learn of the recent death of **Mr. G. E. Mason,** A.M.I.E.E., who retired in December, 1945, from the position of director in charge of the North, East and Midlands Offices of Lancashire Dynamo and Crypto, Ltd. He was the first apprentice of L.D.C.'s forerunner, the Lancashire Dynamo and Motor Co., Ltd.

Managing director of Britannia Electric Lamp Works Ltd., **Mr. W. W. Kublin,** died on February 2, aged 48.

We regret to record the death, on February 9, of **Mr. W. P. Lilwall,** A.M.I.E.E., aged 65, who retired in 1947 after 27 years' service as borough electrical engineer at Fleetwood, Lancs. He was for many years an active member of the committee of the smaller municipal electricity undertakings, and was president of the I.M.E.A. in 1944-45. Mr. Lilwall took up the post of chief at Fleetwood in 1919 after serving since 1911 as chief assistant to Mr. W. A. Walker, borough electrical engineer of Kettering.

We note the death, on February 12, of **Mr. H. J. Carter,** aged 52, who had been managing director of the Carter Electrical Co., Ltd., since his elder brother, L. G. Carter, died in 1945. Mr. H. J. Carter commenced in 1915 in the family business founded by his father in 1911, which was then carried on at Stratford under the name of G. H. Carter and Sons. Following the death of the father in 1920, the brothers continued in partnership and eventually moved to the present large premises at Romford, when the firm was formed into a limited company with L. G. as the first managing director. Mr. H. J. Carter, a skilled engineer with a flair for good engineering, is to a great degree responsible for the high standing of this firm, which, by the way, is now having its highest record of sales.

WILL.—Mr. Frank Forrest, C.B.E., M.Inst.C.E., M.I.Mech.E., M.I.E.E., a part-time member of the South Western Electricity Board and for many years chief engineer and manager of the Birmingham Corporation Electric Supply Department, left £7,968 gross (£7,690 net value).

THE FARADAY LECTURE

A Survey of Lighting Research

Mr. L. J. Davies

ALREADY presented at Nottingham, Birmingham and Rugby, the Faraday Lecture was presented in London on Wednesday of last week. On the chosen subject "Lamps and Lighting—a record of Industrial Research" it would be difficult to find a more appropriate lecturer than MR. L. J. DAVIES, M.A., B.SC., M.I.E.E. (Director of Research and Education, B.T.H. Co., Ltd.), whose special interests have always lain in the field of development and improvement of sources of light.

Commencing with the basic principles of vision, the elements of illumination techniques were illustrated by the startling changes of expression produced upon a plaster cast of a lion's head, by alteration of the direction and intensity of illumination. The four main methods of light production —incandescence, luminous discharge, arcs, and fluorescence—were then shown briefly, and later examined in detail. Contrasts in filament lamps were illustrated by a gastroscope bulb which would pass easily through the eye of a sacking needle, and a lighthouse lamp of 5 kW rating, after which methods of diffusion and concentration were dealt with, and a demonstration given of internal reflector infra-red lamps and spotlights.

Arc discharges were next dealt with in some detail, after which, to illustrate the colour-rendering properties of the new Xenon arc, two identical colour films were run side by side so that its rendering could be compared with that obtained from a tungsten lamp.

Fluorescent lighting principles were shown by coating a glass tube with fluorescent powder and slipping it over a mercury discharge tube, and some amusement was caused by the use of two—apparently identical—discharge tubes, one of which was made of ordinary glass which cut off the U.V. radiation and produced no fluorescence.

A convincing demonstration was given of a point which, although of immense importance, is seldom realised by the layman—the difference between colour appearance and colour rendering when a display containing a number of coloured objects was alternately illuminated with sodium light and an apparently similar light from a tungsten lamp with a yellow filter. The uses of fluorescent lamps in mine and street lighting were also shown.

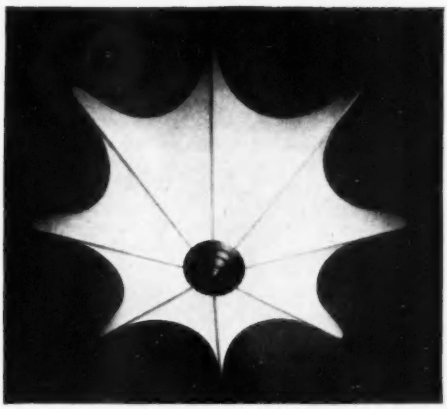
The final section in the lecture dealt with intermittent lighting and some remarkable stroboscopic demonstrations were projected on to the screen. The concluding experiments dealt with the production of photographic flashes, from magnesium through expendable flash bulbs to electronic flash tubes of varying speeds, the fastest of which was capable of giving a sharp image, on a fluorescent screen, of fan blades running at a blade-tip velocity of approx. 100 m.p.h.

Commercial Travellers' Philanthropy

NO trade secrets were divulged at the annual luncheon of the Electrical Trades Commercial Travellers' Association, held last Thursday (as far as we are aware), but there was a general feeling of *bonhomie* which was evident throughout the speeches. To these a breezy start was given by the Rt. Hon. Lord Mancroft, M.B.E., T.D., barrister-in-law, and a member of the Bar, who, proposing the toast of "The Association," emphasised the importance of E.T.C.T.A.'s benevolent fund, despite the various State welfare schemes, and paid tribute to the Association's efforts in providing assistance in necessitous cases.

Replying, Mr. H. A. Deacon urged the necessity for continuing and strengthening the benevolent aspect of the Association, and of recruiting additional members. Responding to the toast of "The Guests," proposed by Mr. L. L. Hughes, Mr. F. French eulogised on the patience and tenacity of purpose of the electrical commercial travellers, who had evidently done their work so well as to gain the reproof of the supply authorities. So many appliances had been sold that the load on the mains had caused embarrassment. The last toast, that of "The Chairman," was proposed by Mr. G. L. Elvy, the immediate past chairman, who, after referring to the difficult wartime period, drew attention to the Association's record Jubilee year under the presidency of Mr. N. V. Everton, when over £2,000 was subscribed for charities. Mr. Fickling, in responding, hoped that the elusive 1,000 membership might be attained this year, and asked for assistance in support of the Association's stand at the Royal Commercial Travellers' School's Garden Party on June 23. For this, it was hoped to obtain merchandise from members and friends.

During the course of the function, it was announced that the charity collection taken had amounted to over £100.



New plastic spray process, reminiscent of post-war "cocoon" process of preserving armaments, aircraft and ships, has interesting peacetime application in speedy fabrication of fireproof, waterproof, contemporary lampshades and novelties for display illuminations

From Cocoons to Chrysaline Starlights

TRADITIONAL methods of lighting the home with table lamps, standards and lampshades, admirable and essential as they are and long will be, somehow do not blend completely with contemporary styles in furniture and furnishings. Probable reason for this is the lack of new methods of fabrication and consequent restriction of design.

With the introduction by W. S. Chrysaline Ltd., 282 High Street, Berkhamsted, Herts, in conjunction with E.T.D. Ltd., of "Chrysaline Starlights," possibly a new era has begun in this business of lamps and lighting.

Simplicity coupled with three important factors, strength, imperviousness to water and a disinclination to support combustion have resulted in the success of these "Starlights," introduced to the trade recently.

Top left is a ceiling fitting in white Chrysaline with scored gold centre cap. Below is a bedside lamp also designed by Beverley Pick, M.S.I.A. The Chrysaline shade is white with yellow nylon flock top and gold trimmings. Right: Another use of Chrysaline, one of several internally illuminated "swans" for the Festival of Britain Gardens in London

The material appears to be similar to that used in the "cocooning" of armaments for preservation after the war. It is sprayed on to the frame of the shade and automatically "shrinks" on to the frame. By this method many interesting designs are possible. Summarising the main advantages of "Chrysaline Starlights": They are seamless, non-inflammable, they can be washed clean without damage to the fabric, they resist pressure (returning to their original shape after pressure is removed), and are free from undesirable shadow because the frames are so designed to prevent shadows other than by intention and because the material affords a high degree of diffusion without loss of efficiency.

"Starlights" are available in many shapes, sizes and designs, are considered most effective when the "Chrysaline" is ivory white and embellished with gold or colour, but may be obtained in pastel shades or with nylon flocking added to the exterior as a colour contrast.

D

Underground Gasification of Coal

THE results obtained from the first experiments in this country on the underground gasification of coal have proved sufficiently promising to justify further work on this method of utilising low grade seams.

Exploratory trials were initially carried out by the Ministry of Fuel and Power at Newman Spinney, near Chesterfield. This system comprised two vertical boreholes 50 ft. apart, connected by a nearly horizontal borehole some 75 ft. below the surface. The seam was ignited in July, 1950, and has been producing gas ever since. For several months gas suitable for use in gas turbines was emitted, but later the quality showed considerable deterioration. Over 200 tons of coal have been gasified, producing about 35 million c. ft. of gas, with an average calorific value of about 50 B.Th.U. per c. ft. A second larger borehole system on similar lines has been prepared ready for gasification this year.

In order to eliminate the horizontal drilling, which presents in the most favourable cases, considerable technical difficulty, and which would be impossible to perform on the majority of seams, other means were sought to obtain the required air passages through the coal. By using high pressure air, pumped down vertical boreholes drilled into the top of the coal seam, it was found possible to lift the overlying strata sufficiently to permit an air flow between holes 33 ft. apart. The coal was then ignited at the lower end of one borehole, and the high pressure maintained until a channel had been burnt through to the other hole.

This method has been in practical operation for two months and there is evidence that the high pressure air system split the strata sufficiently to enable gas to be collected some 100 yd. away from the pressure borehole.

It is proposed to continue work at Newman Spinney this year and to use the high pressure technique on a deeper seam, 200 ft. underground. Dependent on the results of this work, development will take place on the most economic means of utilising the gas. This will probably be by burning it in a gas turbine for electricity generation.

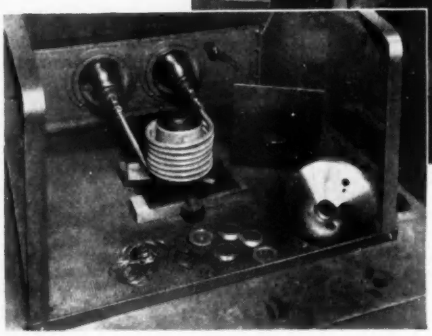
INDUCTION SOLDERING SPEEDS MASS PRODUCTION

A RECENT installation of G.E.C. high frequency induction heating for soldering a reinforcing ring in the manufacture of the copper base of a sink type water heater not only gave considerable increase in production but ensured a better and more consistent product.

Hand torch soldering of a job of this type results in the heating (and consequent softening) of a large area of the base and leaves much to be desired on the score of cleanliness for subsequent plating processes.

The inherent cleanliness and localised heating of induction soldering thus results in a finished part which is stronger and can be more easily polished, and, by the use of pre-formed solder rings, economises in material. The process can be carried out with a 5 kW h.f. generator by an unskilled operator at a rate of over 250 per hour without recourse to special handling gear.

A close-up of the heating coil used for this application is shown. A paxolin plate (which has been removed) is used to prevent contamination of the coil by flux. The primary coil is coated with "Alkathene" which serves not only to keep the coil clean but also to protect it from damage when the plant is located in a corrosive atmosphere.



Above: General view of the unit

On left: Close-up of work head showing parts and solder pre-forms

The BUYER'S *Column*

New Crompton Lighting Fittings

THE latest addition to the range of lighting fittings by CROMPTON PARKINSON LTD., Crompton House, Aldwych, W.C.2, is the elegant Type AR.2531, two 80 W, 5 ft tube fitting giving soft diffused lighting and designed for retail stores, offices and commercial premises generally.

It is a totally-enclosed design which completely excludes dust and insects from the interior and with an exterior surface that can be kept perfectly

The dustproof "Ashford" fitting by Crompton

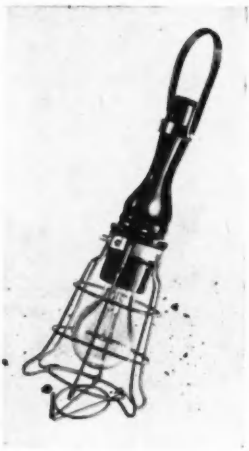
clean simply by wiping. It is available for close ceiling mounting or from chain or conduit.

For easy access to the tubes and starters the diffuser is arranged with a two-way hinge action so that it can be swung down.

Another new fitting, the Type AE.2431 is available in different styles to meet particular requirements of appearance and lighting effect.

B.C.E.'s New "Navy" Handlamp

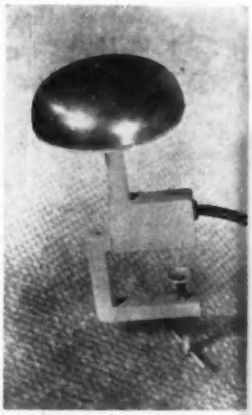
THE latest design by BRITISH CENTRAL ELECTRICAL CO., LTD., 6/8 Rosebery Ave., E.C.1, is the new "Navy" handlamp. It is perhaps a mutual compliment both to the "Senior Service" and to B.C.E. themselves that this handlamp is a step forward in design, is strongly built and "represents value for money." The newly constructed guard now opens at the top to permit lamp replacement. Wire used in its construction is of tough durable type. Wiring of the lamp is an operation of extreme simplicity, the handle incorporating a rubber bush and an insulated grommet designed to protect and grip the cable at the point of entry.



All these new features are available in the improved Navy handlamp at the old list price of 10s. each.

A Mushroom Iron for the Home

INTRODUCED recently as a useful companion to the conventional "flat" iron is the Regency Mushroom Iron by HERMES PRODUCTS (EXPORT) LTD., Munster Park Works, Gowan Avenue, London, S.W.6.



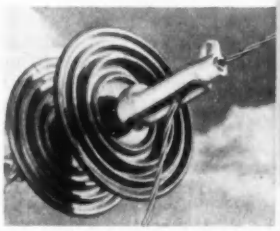
Handy for the housewife is the Regency mushroom iron

Approximately 2¾ in. in diameter the "iron" is intended especially for velvets, velours and embossed fabrics which are ironed from the reverse side, and for sleeves, valances, baby clothes, etc. Its small size and convenient pattern make the iron most efficient for handling small pieces of material and awkwardly shaped garments.

With a loading of 65 W for 200-240 V supplies, the iron sells on the home market at £2 2s. retail.

Getting a Grip on the Line

THE most recent addition to the range of C.C.L. Automatic Mid-Span Connectors and Terminating Clamps for Overhead Transmission lines made by CABLE COVERS LTD., of St. Stephen's House, London, S.W.1, is the type B.S. terminating clamp, which incorporates in its cast body a ball and socket joint.



Cable Covers' B.S. terminating clamp

Its design is such that the trough in the body cannot possibly retain water or excess moisture no matter in what position it may be at any time.

As with every other unit in the range, fitting the conductor is simplicity itself. The conductor is just pushed home into the gripping device and it is fixed, and the greater the tension the more tenacious is the hold. No tools of any kind are needed to make the connection.

Designed for Jointers

RESULT of 30 years' development, the latest "Sheen" portable paraffin furnaces have been especially designed to withstand hard wear and rough usage. The horizontal type 2H has a melting capacity of 1 cwt. of lead in 15 minutes, whilst all models have a control valve to adjust the flame correctly for melting compounds with complete safety. The horizontal and vertical No. 2 models are made by HUGH PRITCHARD AND CO., Old Basford, Nottingham, and are available at £9 19s. 6d. each.

"Sheen" 2H portable furnace

Zirconium Production by Murex

THE production of zirconium metal on a commercial scale has recently been initiated by MUREX LTD., Rainham, Essex. Previously only very limited supplies were available in England.

Sheets down to ·005 in. in thickness, 6-7 in. in width and 2-3 ft. in length are now being made, and it is expected that sheets up to 12-15 in. in width will be available in the course of the next few months. Rods down to 2 mm diameter can be supplied and drawn zirconium wire may also shortly be available.

Zirconium has excellent resistance to corrosion. Hydrochloric acid and fused alkalis have practically no attack on this metal, while its resistance to attack by nitric, phosphoric and sulphuric acids is only slightly less than in the case of tantalum. This property renders it very suitable for use in chemical plant where corrosion resistance is required. It is used in electronics as grid emission inhibitors replacing tantalum or molybdenum.

Pumpless Steel Tank Rectifiers

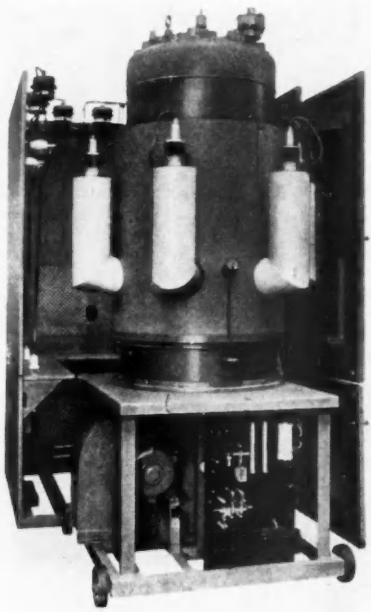
THE production of the pumpless, air-cooled steel tank rectifier by THE GENERAL ELECTRIC CO., LTD., 18 years ago, still remains one of the more outstanding achievements in the conversion of electrical energy.

Today this form of rectifier is manufactured in sizes corresponding to a normal current range of 350 to 1,250 amps per cylinder for d.c. voltages up to 800 V, while rectifiers for voltages of 1,500 and 3,000 V are produced with outputs of 1,000 and 1,500 kW in single units. All ratings are based on a 125% load for two hours and progressively heavier overloads up to many times full load for a few seconds.

It is usual for the complete equipment to be mounted in a sheet steel cubicle, which, in the earlier designs, was constructed from steelplate of comparatively heavy section bolted or welded to an angle iron structure of ample strength to carry the weight of the rectifier cylinder and its auxiliaries. In modern equipments the rectifier and its associated auxiliaries are mounted on a separate platform which is supported by angle irons secured to the foundation channels so that no weight is transmitted to the cubicle itself. Hence a lighter form of construction becomes practicable, as the cubicle now serves mainly to prevent accidental contact with "live" rectifiers and to contribute to the control of the flow of cooling air over the rectifier cylinder. This has made possible improvements in the construction and appearance of the cubicles which are now built from prefabricated steel panels of relatively light section.

In order to simplify installation, inspection and maintenance, the design has been modified to incorporate drawout features, the platform which supports the rectifier cylinder forming the top of a removable truck. The connections between the truck and the cubicle are arranged so as to permit easy withdrawal of the rectifier truck.

The centre of gravity of the complete truck assembly is well below the bottom of the anode arms so that the truck is perfectly stable and can be moved easily on a smooth floor. Where necessary, rectifier cylinders can be off-loaded from the lorry on to their trucks and wheeled into position in the cubicles.

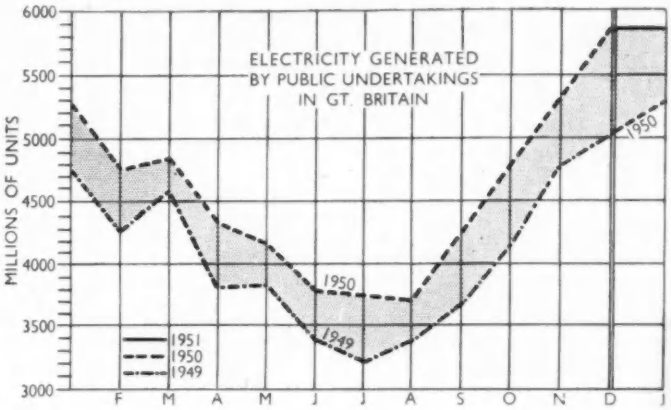


UNITS GENERATED

5,946 million units was the total generated during January, 1951, in stations under the control of the B.E.A., the North of Scotland H.E. Board and the Lochaber Power Co. The corresponding figure last year was 5,271 million, so there has been an increase of 12·8%.

Of the total, 5,779 million units were generated in steam stations, and 145 million in hydro-electric.

Energy sent out during the month was 5,628 million units, 94·7% of that generated, and 12·9% up on the total for the same period of 1950.



POWER SUPPLY IN JANUARY

LLYNFI, in the South Wales Division of the B.E.A., is the only station to figure in January returns as having increased installed generating capacity. A 30 MW English Electric turbo-alternator was commissioned there as the first of two which are programmed under present extension arrangements.

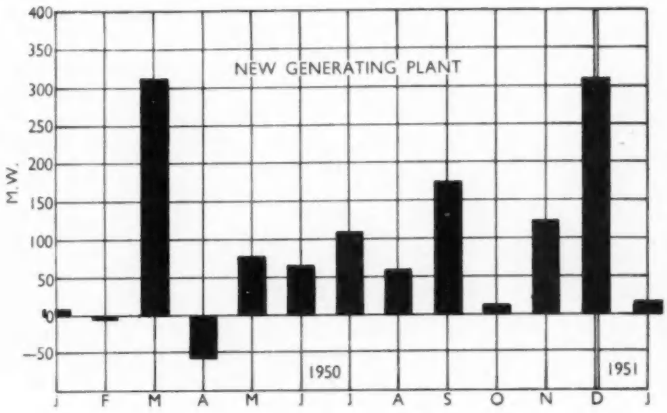
New Boilers

Two stations which increased their output capacity by the completion of new boilers are Neepsend (Sheffield) and Thornhill (Dewsbury), both in the Yorkshire Division. At Neepsend the unit is of Mitchell design, with a rating of 190 klb/hr, and leaves one similar unit to be completed for the conclusion of present extension arrangements. The Thornhill boiler is also a Mitchell unit and has a rating of 200 klb/hr.

In B.E.A. stations 5,746 million units were generated by steam power, and 33 million in the North of Scotland, making a total of 5,779 million units from steam plant. For this purpose 3,434 thousand tons of coal and 79 thousand tons of coke were consumed, together with some fuel oil. In addition, the generating stations used 12 thousand tons of coal for the generation of steam for sale.

Help to the coal shortage was given during January by the use of oil engines in public supply stations to generate 16·6 million units, and of waste heat to provide a further 4·5 million units. These figures compare with 12 million units and 9·8 million units respectively in January, 1950.

Overall, the use of coal was up 13·4% and of oil 65·7% to give the 12·9% increase in units sent out.



GENERATING PLANT

At the end of January, 1951 the installed capacity of the B.E.A. was 14,571 MW, showing an increase of 14 MW during the month. The North of Scotland total remained unchanged over the same period, at 528 MW. The figure for overall increase in the 12 months ending January 31 is 1,195 MW, or 8·6%.

The installed capacity for the purpose of this graph should be distinguished from the output capacity. The installed capacity is the total m.c.r. of all the generating sets which are connected on both steam and electric sides and are suitable for service.

THE WEEK

COMMERCE *in news* INDUSTRY

N.F.E.A's Views on that 2d.

THE extra 2d. an hour awarded to electricians working on the Festival of Britain site (as we noted last week) would be paid "but only under duress," Mr. L. C. Penwill, secretary of the National Federated Electrical Association, has stated. On the recommendations of the Committee appointed by the Minister of Labour, the Association says it cannot accept the Committee's premise that the greater part of the work on the South Bank and Battersea Park sites is now "display work," and analogous to exhibitions such as Olympia, Earls Court and White City. The Association contends that the workmen engaged at the site have no special responsibilities which do not apply to work on other premises of national importance at the present time. Also, the vast majority of the electrical work being carried out on the South Bank is of a permanent type. It is also pointed out that the Committee has limited their recommendation of extra payment to adult operatives, without taking into consideration the fact that a large number of those employed there are adult mates, and not electricians.

Lead is Rationed

FURTHER rationing of non-ferrous metals was announced by the Ministry of Supply last week. In accordance with the latest Order, which has been made effective from February 1, lead is to be rationed and supplies to consumers restricted to 90% of the average monthly consumption during 1950. Zinc rationing for next month is to remain at the same level. For the ordinary brand this is 50% of the monthly average for the first nine months of 1950, with 80% for electrolytic zinc used in brass-making and the special high purity grade, and 70% for other electrolytic zinc. The allocation of imported copper during March and April will also be the same as this month—85% of the average monthly consumption during the first half of 1950.

Denis Ferranti forms own Company

AS foreshadowed in our issue of February 8, Mr. Denis Z. de Ferranti has formed his own company following his resignation from the directorship and position of general manager of Ferranti Ltd., Hollinwood. He has acquired the Pearson Electric Co. Ltd., transformer manufacturers, of Dewsbury. The name of the company has been changed to Denis Ferranti Co. Ltd., and its share capital substantially increased. New premises have been taken at Royton, Oldham, for the manufacture of transformers up to 2,000 kVA, and production has already been started. Mr. de Ferranti retains his holding in Ferranti Ltd., in which he has 256,666 10s. Ordinary shares, just over a quarter of this class of capital, and a substantial block of Preference shares. Directors of the new company are D. Z. de Ferranti, G. Z. de Ferranti, I. H. Hedley, T. Ogden and W. Pauls.

Supply Handbook—1951

THE fourth edition of our "Electricity Supply Handbook" has been published this week, price 3s. 6d. plus 3d. postage. This brings up to date the list of personnel of the British Electricity Authority, the Generating Divisions, Area Boards, and North of Scotland Hydro-Electric Board, in addition to other supply authorities, with an index providing easy reference. Both text and the maps have been thoroughly revised, with the willing help of the authorities concerned. In this edition, statistics culled from the 1949-50 report of the B.E.A. and the Boards is included, and, in regard to sub-areas, totals of units sold, consumers, etc., are given for the first time. Copies of the edition may be obtained from ELECTRICAL TIMES offices at Sardinia House, Kingsway, W.C.2.

Effects of Coal Price Increases

FOLLOWING the B.E.A's statement concerning coal price increases and their effect on electricity charges (reported in these columns last week), the S.W. Electricity Board has been quick to conclude the measures which will be necessary in that particular area to cope with the new burden. The Board will have to find at least an additional £200,000 during 1951-52, of which three-quarters

The First Half-Century

Tonight Mr. W. L. Madgen (General Manager of the ELECTRICAL TIMES) will ask the Institution to appoint a special committee to consider what steps should be taken towards removing the legislative disabilities under which the industry now suffers. This practically means that the Institution as such should support the Power Bills, endeavour to get the Tramways Act and other similar legislative blots repealed and generally declare against municipal trading.—*From our issue of February* 21, 1901.

will have to come from domestic and commercial consumers. The balance of £50,000 will be provided by industry, whose tariffs will rise automatically with the increase in coal prices. The Board has stated that in order to obtain the necessary £150,000, it will be forced to revise all existing tariffs which do not include coal price adjustment clauses.

Sir Joseph Hallsworth, chairman of the N.W. Board, commenting on the same statement, said it was estimated that a further £900,000 would have to be found in the N.W. area. Under half of this amount would be recovered from industrial consumers subject to coal clauses.

Peak Electrical Exports

B.E.A.M.A. announced last week-end that the value of exports of electrical machinery, goods and apparatus during 1950 totalled £159 million. This amount was a record for the industry and showed an increase of nearly £20 million over the previous year. Last year's figures show that exports were also about seven times the value of goods exported during 1938.

Radio Production Census

TOTAL value of sales of the radio and telecommunications industry during the year 1948 amounted to £104,030,000, according to the latest preliminary census of production report covering that trade. Corresponding figure for 1946 is £87,121,000. This report relates to 396 private establishments engaged in the manufacture of telegraph and telephone equipment, radio apparatus, gramophones, electric lamps, and discharge lamps. In 1948, these concerns employed a total of 133,391 persons, of which 100,271 were operatives, the total wages bill amounting to £38,667,000 for that year. In value, the net output per person employed was £448 in 1948, compared with only £357 in 1946.

As a sub-section of the report, 15 establishments operated by Government Departments had a gross output in 1948 to the value of £44,533,000. These employed 67,191 persons, whose wages and salaries totalled £24,228,000 in that year.

New Bradford Showrooms

NEW showrooms have been opened recently by Falk, Stadelmann and Co. Ltd., at 19 Union Street, Bradford. They contain a comprehensive display of all types of decorative, commercial and tungsten lamp fittings, both in modern and period designs, as well as a wide range of domestic appliances. On the lower ground floor a trade counter carries a complete stock of electrical accessories, cable and switchgear.

Lighting for Display

MEMBERS of the British Display Association last Thursday heard a lecture on display lighting by Mr. R. L. C. Tate, F.R.S.A., of the Lighting Service Bureau, in which he discussed the advances in shop window lighting technique made in the last year, illustrating his remarks with slides and demonstrations.

The use of spotlights particularly, both at home and abroad, was discussed and reference was made to the growing use of the new coloured fluorescent lamps to light window backgrounds. Highlights of this part of the talk were demonstrations of the technique of throwing coloured shadows on a translucent screen from behind the screen, and an amusing trick whereby movement was suggested by the alternate use of red and green light on a screen painted in the same colours.

On the interior lighting of stores, particular reference was made to the growing use of colour-matching lamps in shop interiors, and to the effect of the colour of decorations on the apparent colour of light-sources.

Mr. Tate concluded his talk by demonstrating a number of outside lighting features suitable for use during the Festival of Britain.

A section of G.E.C. of India Ltd.'s stand at the Engineering Exhibition held in conjunction with the World Power Conference. On the stand was a model of the first coal washer installed in India, a range of motors manufactured at the company's Paharpur factory, a sample of 275 kV oil-filled cable from Pirelli-General Ltd., and a display of lighting fittings

Machinery for Forbidden City

GENERATING equipment worth about £12,000 and made by the Kendal firm of Gilbert, Gilkes and Gordon Ltd., for the electrification of Lhasa, the Tibetan capital, is still in this country, although it should have been despatched before Christmas. Since the Tibetan Government evacuated Lhasa following the threat of Communist invasion, the firm has heard nothing concerning the disposal of the equipment. The generating set is water-driven and designed to work from mountain streams, but it was broken down into one-ton loads suitable for yak transport, and consequently will be difficult to dispose of elsewhere. The machinery was to have been erected by the Tibetans themselves, who refuse to allow Europeans to enter Lhasa.

This impressive floodlighting installation was provided by the G.E.C. within five hours of the opening of the new Electra House building at Hong Kong. Four floodlights were mounted on a jeep parked in front of the building and an additional four on lamp standards on either side. All were the "Singapore" type with 1,000-watt projector lamps. Electra House is the new Far East headquarters of Cable and Wireless Ltd.

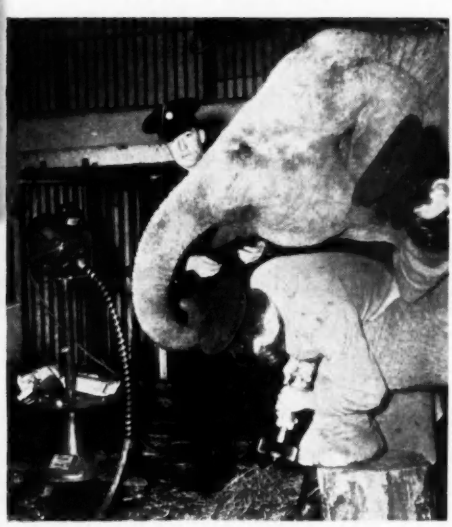
Radio Sales Dispute

THE Leeds Chamber of Trade decided at their meeting last week to protest to the Yorkshire Electricity Board for trading in radio and television sets. As reported in our issue of January 11, the Board decided to enter the radio retailing field and displayed sets in their showroom windows, thus competing not only with traders in other parts of the town, but also with retailers in the same block of buildings. The complaint came from a firm which pointed out that by an agreement in their lease with the Leeds Corporation, they were unable to compete with any other tenants. It was urged that a vigorous protest be made to the Corporation, and if necessary that the matter should be taken to Parliament.

Exeter wants an Electric Club

REPRESENTATIVES of various sections of the electrical industry in and around Exeter met last week to discuss the possibility of forming an Electric Club in the district. Similar clubs are at present flourishing in Birmingham and Bristol, and Mr. A. T. Haywood, president of the former, addressed the meeting, outlining the aims and constitution of his own organisation. The chairman, Mr. G. S. Mogridge, said that the attendance of some 60 people seemed to indicate that such a club was needed in Exeter. The meeting decided to appoint a temporary committee to discuss details, and it was hoped that the formation of an Exeter Electric Club would greatly assist those engaged in the industry with the exchange of information and ideas.

Jumbo gets a manicure at the London Zoo, and by his expression it is an experience this elephant won't forget. The machine on the left was made by Flextol Engineering Co. Ltd., and is a heavier model than those regularly used for grooming horses. A ¾ h.p. motor running at 2,850 r.p.m. drives the brush which is of fine gauge steel wire. The keepers say a month's work can be done in an afternoon, and the elephants are obviously "all in favour, too"



1,150 Cookers for Brisbane

A LARGE order, valued at about £27,000 and involving the supply of 1,150 electric cookers to the Brisbane City Electric Light Co., has been obtained recently by Elexcel Ltd. The contract was negotiated by Relco Ltd., which acts as export distributors for the company. This follows an original contract negotiated with the supply authority for 600 cookers when Mr. E. G. Sellers, Elexcel's sales director, and Mr. G. L. Beaumont, sales manager of Relco Ltd., visited Brisbane during their tour of Australia three years ago.

Fluorescent Stage Lighting

THE new fluorescent stage lighting at the Regent Theatre, Kings Cross (see our November 30 issue), was the subject of a lecture and demonstration on Monday. Although organised primarily for students, many prominent members of Electricity Boards and the theatrical profession attended to learn about what, it is claimed, was the first installation of fluorescent stage lighting in the world. After an introduction by Mr. A. S. Shier,

director of Thorn Electrical Industries, who produced and developed the scheme, technical data was given by Dr. J. W. Strange.

Since the first demonstration was given two years ago, over 20 theatrical productions have employed fluorescent lighting from the Atlas transportable units. The third permanent stage installation is now in service and others, said Dr. H. H. Ballin, were being produced.

Electricity Arts and Crafts

AN idea born in the Merseyside and N. Wales Division three years ago grew and developed into a series of small exhibitions and culminated last week when the electricity supply industry's National Arts and Crafts Exhibition was held at the Old Horticultural Hall, Westminster. There were 1,800 exhibits in 21 classes, covering numerous hobbies and pastimes, but the articles on show were only the prizewinners in the 31 local exhibitions held throughout the country during the past twelve months. Competitors sent in some 11,000 entries which included detailed models of locomotives, intricate woodwork designs, photographic masterpieces and needlework, to mention but a few of the many represented activities which employees in the industry indulged in during their leisure hours.

The standard of exhibits was remarkably high and judges must have had a great deal of courage to decide that any one entry was, in their opinion, better than another. In the absence, through illness, of the Rt. Hon. Philip Noel-Baker, Minister of Fuel and Power, Sir Henry Self formally opened the exhibition.

Floor Maintenance

FOUR HUNDRED delegates are to attend the conference of housecraft advisers, senior demonstrators and showroom assistants, organised jointly by E.D.A. and E.A.W. The Rt. Hon. P. J. Noel-Baker, Minister of Fuel and Power, will open the conference, which is to take place at the Cowdray Hall, Henrietta Place, W.1, on March 7. An exhibition of floor maintenance equipment and steam-electric cooking will be held in the Seymour Hall, nearby. On the day of the conference it will be confined to delegates, but on the following day will be opened to the public. The exhibition will include practical demonstrations of the latest electrical labour-saving devices for floor maintenance, and of modern electric cookers.

Leeds Sub-area H.Q.'s new Premises

THE Leeds (No. 4) sub-area headquarters of the Yorkshire Electricity Board has moved from its old address in Whitehall Road to Bramhope, near Leeds. All invoices and statements concerning goods supplied to district offices and stores, cooker stores, service centre and installation departments, and stores and offices at Wetherby, Garforth, Morley, Hammond Street (Leeds 10), and Tadcaster, should in future be sent to Bramhope.

3,253 Now Hold E.A.W. Certificates

THE results of E.A.W. Housecraft Certificate examinations for demonstrators, saleswomen and teachers, over the past 20 years or more, seem to indicate an increasing realisation of the need to give domestic science students instruction in the applications of electricity in the home. Following the latest examinations held just before Christmas, 1,644 demonstrators and 1,609 teachers now hold one or other of the Association's certificates. The results of the December examinations were announced this week and show that 53 saleswomen and demonstrators passed, of which eight gained

Two scenes from the models section at last week's Arts and Crafts Exhibition, with (left) Sir Henry Self and Sir John Hacking discussing the cooker replacement problem!

An attractive stand designed by the N.W. Electricity Board, which was to be seen at the Hotel and Catering Exhibition in Manchester. It took the form of a miniature theatre where film shows and talks on electrical catering were regularly given

distinctions. In the similar examination for teachers, the twenty-fifth to be held, 59 qualified for the certificate and five of these gained distinctions.

Seventy Years Old

THE Ordsal electrical engineering firm of Dorman and Smith Ltd., celebrated their seventieth anniversary with a dance last Thursday and a dinner-dance on the following evening. The company was founded in Salford in 1881 as Raworth and Co. Included in its history is the supply of electrical equipment to the Navy during the first world war. In the recent war the company made a special feature of lighting for ordnance factories and air raid shelters, and to bring the history up to date, Dorman and Smith are now engaged on the installation of switch and distribution gear in the new Palace of Westminster and Festival of Britain concert hall.

NEWS IN BRIEF

The maximum prices of iron and steel in various forms has been increased as from February 21, under an Order made by the Minister of Supply.

For the first time since the war, Great Britain will be represented by a national stand at this year's Foire de Paris, the Paris international trade fair, to be held from April 28 to May 14. May 4 will be celebrated as "British Day" with a banquet in honour of British exhibitors.

Written, produced and acted entirely by themselves, Ekco players this year maintained the high standard set up in previous years with their presentation of *Sleeping Beauty*. The show ran for one week in the works canteen.

Telcon's annual children's party, held recently, was spread over two afternoons one weekend in order to accommodate all the 750 children invited. The youngsters enjoyed a high tea and entertainment in the works canteen, and themselves contributed to the latter with party pieces.

We note that J. L. Eve Construction Co. Ltd., came of age recently, and to celebrate the occasion 23 members of the staff, engaged in 1930, presented an engraved clock to the company at the annual dinner. The clock was handed to Mr. J. L. Eve by Mr. T. O'Leary, the oldest member of the staff.

B.E.A.M.A. has organised an open meeting to be held at the Connaught Rooms, W.C.2, next Tuesday, at which manufacturers in the motor control gear and small air-break switch industries will be able to meet and discuss production problems with the Productivity Team which visited the United States in 1950.

Following the success of the first "Minibition" organised by the Purchasing Officers Association at Brighton last September, arrangements have been made to repeat the exhibition at the Craigside Hydro, Llandudno, from September 27 to 30, in conjunction with the Association's 1951 national conference.

The British Council has arranged an exhibition of 560 scientific and technical books for the new premises of Royal Agricultural and Commercial Society in Georgetown, British Guiana. The exhibition will include over 200 books on engineering, with particular reference to civil and electrical engineering.

The Mayors and Mayoresses of Heywood and Salford recently visited the works of Salford Electrical Instruments Ltd. After lunch in the canteen they toured the factory with Mr. H. Cobden Turner, managing director. The party is seen here with 70-years-old Mr. Philip Hamblett, who completes 55 years service next month

Questions in Parliament

Electricity Prices

Questioned as to the average increase in the cost of electricity and gas as a result of the recent rise in prices of coal and coke, Mr. Robens pointed out that such prices were fixed by the Electricity and Gas Boards, who had a statutary responsibility to pay their way. He was then asked about the progress in developing schemes for generating electricity from the water power of rivers and tides, to which he replied by stating that about 1,500 million units were produced in Gt. Britain from water power in 1950—an increase of 25% on 1949. It was often alleged that our river power could be used without the construction of large works, but when such plans had been examined they were found to be impracticable. The policy was, however, to use water power to the greatest possible extent.

Efficiency of Heating Appliances

Replying to Mr. Pitman, Mr. H. Morrison gave the latest information available from the D.S.I.R. on efficiencies of various types of modern domestic heating appliances (see table). He explained that it was impossible to give one figure for each type of appliance that represented the diverse advantages and disadvantages of the different methods of heating. The table was based on published figures and on experimental results obtained at the Building Research and Fuel Research stations of the D.S.I.R. The final figures must, however, be treated with reserve, since the types of fuel used in power stations were not generally suitable for domestic use, and since the amount of heat derived from the appliances depended, with solid fuel appliances, on their type, on the skill with which they were used, on the grade of fuel employed, and, with both gas and solid fuel appliances, on the rate of air flow up the flue. The figures applied only to continuous room heating, and took no account of convenience, cleanliness or other amenities. It was the view of the Minister of Fuel and Power that, in the present circumstances, it was not desirable that electricity should be used for continuous room heating.

Exports of Metal Goods

When the question of metals was raised, Mr. Wilson said he hoped soon to make an announcement about the use of zinc and copper in articles for export.

Fuel Economy

Asked what he had done to secure that the publicity activities of the electricity and gas industries were co-ordinated with his efforts to secure economy in the use by the public of electricity and gas, the Minister of Fuel and Power said he had set up a committee consisting of representatives of the electricity and gas industries, the National Coal Board, and the Coal Utilization Joint Council, with the Parliamentary Secretary to the Ministry in the chair. The committee had been asked to ensure that all the publicity work of the three industries is co-ordinated with the efforts to secure economy in the use of fuel and power.

H.E. Board's Fishings

The North of Scotland Hydro-Electric Board owned the Brahan and Seatwell fishings on the River Coron, also at Invergarry, Loch Faskally, the new reservoir at Pitlochry and six other minor ones, the Joint Under-Secretary of State for Scotland disclosed, and it was evident that the Board realised their importance.

H.P. Facilities

Again raising the matter of the hire-purchase facilities offered by the B.E.A., Mr. Marlowe asked for comparable figures of the Authority and private concerns. When Mr. Robens replied that he doubted whether figures of the facilities offered by private traders could be obtained, he was asked then how did it come about that the Minister, in an earlier debate, stated that the figures were not strictly comparable? Mr. Robens then suggested that that question should be addressed to the Minister himself.

Efficiencies of Methods of Continuous Room Heating

	Coal (in closeable open fire)	Coke (in closeable open fire)		Gas (in convector fire)		Electricity
		(1)	(2)	(1)	(2)	
(*a*) Percentage of potential heat in original coal available at appliance (neglecting losses of coal in transit)	100	73(3)	100	73(3)	48(3)	20(3)
(*b*) Efficiency of good modern appliance, i.e., percentage of (*a*) deliveries as effective heat by the appliance to the house (including heat gained from flue)	50-60	60-70	60-70	60-70	60-70	100
(c) Overall efficiency (percentage) with which potential heat in original coal is delivered as effective heat in the house (*a*) x (*b*) ...	50-60	44-51	60-70	44-51	29-34	20

(1) Figures in these columns based on the convention that gas and coke are both produced with the same efficiency.
(2) In these columns the alternative convention has been adopted of debiting the whole of the heat loss at the gas work, to gas and assuming that the coke is produced with 100 per cent. efficiency.
(3) Average for the whole country. The figures will become much higher as installation of the most modern types of gas works and power stations progresses. The figures in "coke" and "gas" columns are taken from the report of the Heating and Ventilating Committee and relate to 1937. Electricity figures from the B.E.A. 1949-50 Report.

Load Shedding Warnings

Three questions were put to Mr. Robens concerning warnings of power cuts, and in particular the radio plan. He replied that discussions were still going on with the B.E.A. and the Area Boards on the matter. In the meantime the rota system was being perfected, and more generally applied; telephone warnings were being extended, and experiments conducted with short-wave radio transmitters and receivers, but there were still difficulties to be overcome. In a written answer to a question by Mr. Gammans, he also stated that experiments were being made in the use of ripple injection into systems.

London Airport Strike

The Attorney-General was asked what action he proposed to take against the E.T.U. for supporting the illegal strike of electricians at Heathrow. To which he replied "None." Mr. Shepherd then wanted to know if it was to be assumed that in future unions could give financial support in illegal strikes without incurring penalties. This, answered the Attorney-General, would be a very unsafe assumption to make. In this instance, the circumstances were investigated, but he came to the conclusion that it was not a case in which to take action.

London-Southend Railway

On the motion of adjournment Mr. McAdden raised the question of the railway service between London and Southend to "draw attention to some of the deficiencies of the transport facilities." In this he was supported by other members. In reply, Mr. Barnes said that, on consideration of the London working plan, he had authorised the British Transport Commission, as soon as economic conditions permitted, to go ahead with electrification of the line. But no time factor was involved; it was dependent entirely on economic conditions, and the authorisation did not mean that the process of electrification would be started at present. Although it did not solve the Southend problem, on the suburban lines of the old L.N.E.R. to Shenfield there had been a similar position. The locomotives and coaches were worn out and that condition remained for a number of years. It was not desirable to spend money on fresh rolling stock when the intention was to electrify. Now, since it had been electrified, travel on that line had been entirely transformed. If conditions permitted the Railway Executive to complete the electrification of the Southend line, that part of the country would be as well served as any part of the country at present or in the immediate future. He had, however, set up a consultative committee for the East Anglia area to consider representations.

Lord Citrine's Speech

When the matter of Lord Citrine's speech was again raised, Mr. Robens said the published extracts had been considered, but the Minister placed a different interpretation upon them than did Mr. Boyd-Carpenter.

Parliament's Consumption

Electricity consumption in the Palace of Westminster for the month ended January 27, 1951, was 141,274 units, Mr. Stokes stated, but Sir Herbert Williams wanted to know the consumption when the House was sitting.

Electric Supply News

Belfast

At a special meeting last Thursday, Belfast Corporation approved the building of the new Victoria power station, at a cost of about £4,215,750, on the Co. Antrim side of the Belfast Harbour estate. Authority was given for the immediate negotiation of provisional contracts for plant, boilers and other equipment, estimated to cost almost £2,000,000, with the firms whom we noted last week. The capacity of the existing generating station on the Co. Down side of the harbour is 144 MW, and the capacity of the new plant, which is expected to be in service during the winter of 1953-54, will be 60 MW. At Ballylumford the capacity is 90 MW. Further capacity will be necessary for the winter of 1955-56, and it was disclosed by the chairman of the Electricity Committee, Alderman W. H. Cooper, that experts were in Ulster at present considering whether the Victoria station should be ultimately extended or another station established outside Belfast. When the question of coal supplies was raised, Mr. W. Girvan, city electrical engineer, explained that under the 1948 Act electricity supply authorities were required to pool their generating costs. The cost of production (which included all overheads and annual charges on plant and buildings) at Ballylumford and the Harbour power station were merged, and the power sold back to the authorities by the Joint Electricity Committee at the cost of production.

Cumberland

Details of the B.E.A.'s proposals to run a new power line from Newcastle to Glasgow via the gap through the Pennines to Carlisle came before Cumberland County Council last week, when it was explained that the new line would have to cross Hadrian's Wall at a number of points. The B.E.A. has been informed that its proposal would not be in the public interest so long as an alternative route could be followed. An alternative had been suggested by the committee and this is being considered by the authority.

Devon

The B.E.A.'s new 132 kV grid transmission line, affording a bulk supply to the North Devon area of the South Western Electricity Board, recently came into service. The new line runs from the generating station under construction at East

Yelland, through South Molton and Bampton to Taunton, where it connects with the national grid. Construction was carried out by British Insulated Callenders Construction Co., Ltd. Plans are now well ahead for the extension to Fraddon, in Mid-Cornwall, thus completing from Taunton to Fraddon the longest length of double circuit transmission line (110 miles) under construction in the country at the present time.

Easington

The Rural District Council has expressed dissatisfaction at the delay in making arrangements for the North-Eastern Division of the B.E.A. to take over generating plants still controlled by the National Coal Board in that area. The Council approached the Ministry of Fuel and Power, but was told that it was a matter for the B.E.A. and the N.C.B. The Council has asked the Northern Group of M.P.s to meet the Council's officers.

Shoreham

The British Electricity Authority has decided to continue with the £1,500,000 improvement scheme at Shoreham Harbour, which will allow colliers of up to 4,000 tons to bring coal to Southwick power stations.

Stourport

The 60 MW hydrogen-cooled alternator which was taken out of service last November, for the purpose of making modifications, has been re-installed in the Stourport "B" station, and is expected back in service within the next few days.

Tobermory

The Secretary of State for Scotland has approved constructional scheme No. 57 of the North of Scotland Hydro Electric Board, under which the former Ledaig Distillery building at Tobermory is now to be used as a generating station to deal with the growing demand in Mull. The existing small hydro-station scheme on the Tobermory River is to be extended and hydro-electric and diesel plant with a combined capacity of 1,000 kW is to be installed in the new station. Estimated cost of the scheme is given as £92,000.

LIGHTING SCHEMES

Gravesend.—T.C. applying for consent to borrow £2,750 for extending mercury lighting along Overcliffe.

Omagh (Co. Tyrone).—The U.D.C. is considering changing over to electric street lighting.

Retford.—M.o.T. has informed the T.C. that a grant of 50% will be made towards the cost of the new lighting installations.

Stoke-on-Trent.—T.C. is recommended to invite tenders for street lighting on the main route Longton-Goldenhill. Estimated cost £20,357.

Towcester.—Scheme for converting street lighting to electricity is to proceed. It is proposed to instal 24 fluorescent lamps in the Watling Street and 66100-W lamps in side roads.

Company Activities

H. J. Baldwin

The directors have decided to issue 150,000 of the remaining 300,000 Ordinary shares at 5s. 9d. each, on the basis of one for every eight Ordinary held. The new shares will rank *pari passu* with the existing 1,200,000 Ordinary shares as to dividends, except for the interim of 10% being paid for the year to March 31 next. The £41,375 thus raised is to be applied in reduction of the bank overdraft, which at February 1 amounted to £59,302.

Falk Stadelmann & Co.

The directors propose to issue £100,000 4¼% Unsecured Loan Stock, and to offer to shareholders 50,000 7% £1 Cumulative Preference shares at 25s. each and 57,750 £1 Ordinary shares at 36s. The loan stock is being placed privately.

Hubert Davies & Co.

The directors of this well-known South African concern are considering the issue of additional capital, in view of the increasing costs of the products handled. Authorised capital is £1,300,000, of which £1,003,602 has been issued.

India Rubber, Gutta Percha & Telegraph Works Co. Ltd.

For the year to September 30 last, the group net profit of this old-established company amounted to £31,908, as compared with £23,552 in the previous twelve months. Taxation absorbs £128,541, as against £62,708 in 1949-50. After deducting exchange loss on Argentine current assets and deferred repairs, there is a balance of £101,949 (*£49,643*), of which £4,967 relates to subsidiaries and £96,982 (*£45,683*) to the parent company. There is a Preferred Ordinary fixed dividend of 6%, and an additional 2% (*same*) and an Ordinary fixed dividend of 6% plus an additional 3% (*same*).

Dividends Declared

Clarke, Chapman and Co. Ordinary dividend of 15% (*12½%*), net profit for 1950 was £178,508 (*£172,098*).

G. Cohen Sons and Co. Interim of 8% (*same*), payable on March 31.

Heenan and Froude. Interim of 5% (*same*) on increased capital.

Hoover Ltd. Final Ordinary Dividend 22½% on doubled capital, making 35% (*45%*).

Taylor Tunnicliff (Electrical Industries) Ltd. Dividend of 20% (*15%*), less tax. Net profit for 1950 was £136,677 (*£123,428*).

Westinghouse Brake and Signal Co. Dividend of 14% (*same*).

Commercial Information

CONTRACTS OPEN

HOME

Feb. 23.—Belfast. Forster Green Hospital require supply of electrical engineering materials for year ending March 31, 1952. Secretary of Hospital Management Committee, Fortbreda, Belfast.

Feb. 23.—Inverurie T.C. Electrical installation in erection of 20 houses on Kellands site. Burgh Surveyor, Town House.

Feb. 24.—Dagenham. Supply and erection of 217 Group A lighting units in Valence Ave., Rainham Rd., Whalebone Lane North, and Parsloes Ave. Borough Engineer and Surveyor, Civic Centre. (See Feb. 8 issue.)

Feb. 24.—Dublin. Supply of electrical fittings. City Engineer, 28 Castle St., Dublin.

Feb. 24.—Grantham T.C. Supply of electric baling press for waste paper, rags, etc. Bale to be approx. 15 x 30 x 6 in. Tenders to John F. Guile, Town Clerk, Guildhall.

Feb. 24.—Perth. Electrical work in 74 flats on Letham housing development. Applications by above date to Burgh Surveyor, 16 Tay St.

Feb. 24.—Surrey C.C. Supply of electric lamps for 12 months from April 1. Application for tender forms, etc., to Chief Supplies Officer, 3 Palace Rd., Kingston-upon-Thames.

Feb. 24.—Swansea T.C. Electrical installation in 44 flats at New St. Applications by above date to Borough Architect, Guildhall, Swansea. Deposit £2. (See Feb. 8 issue.)

Feb. 26.—Atherstone U.D.C. Supply and erection of street lighting equipment on trunk rd. A47 including concrete columns and lanterns. D. C. Smith, Engineer and Surveyor, Council Offices, Long St. Deposit £2 2s. (See Feb. 1 issue.)

Feb. 26.—Bedworth U.D.C. Supply and erection of automatic booster installation, comprising two electrically driven pumps of 60,000 g.p.h. with switchgear, etc., for Saunders Ave. pumping station. C. S. B. Cooper, Water Engineer, Council Offices, High St.

Feb. 26.—Lochgelly. Electrical work in erection of 26 houses on Cooper Ha' Park site. James Gentles and Son, chartered quantity surveyors, Kirkcaldy.

Feb. 26.—Manchester. Electrical installation at Charlestown infants' school in Pilkington Rd. City Architect, Town Hall. Deposit £1 1s.

Feb. 26.—N. Ireland. Alterations in change from d.c. to a.c. supply at Holywell Hospital, Antrim. F. D. Brown and Sons, consulting engineers, 93 Ann St., Belfast. Deposit £5.

Feb. 26.—Rochester T.C. Lighting is included in road works to be carried out in Woodstock Rd. City Surveyor, 66 Maidstone Rd., Rochester.

Feb. 26.—Runcorn U.D.C. Supply of electric lamps as part of annual contracts for 12 months ending March 31, 1952. T. J. Lewis, Clerk of the Council, Town Hall.

Feb. 26.—Salford. Complete electrical installation at primary school in Summerville Rd. City Engineer, Town Hall, Bexley Square, Salford 3. (See Feb. 1 issue.)

Feb. 26.—Slough. Provision of 50 concrete columns, lanterns with 80 W mercury-vapour equipment, and erection of 10 columns and installation of equipment for street lighting in Westfield and Hinton Rds. and Bridge Close. Borough Engineer, Town Hall. Deposit £1 1s.

Feb. 27.—Thurrock U.D.C. Installation of approx. 1,559 refrigerators (of which about 1,395 will be operated by electricity), in existing council houses. Details from A. E. Poole, Clerk of the Council, Council Offices, Whitehall Lane, Grays, Essex. Deposit £3 3s. (See Feb. 8 issue.)

Feb. 28.—Bridgnorth. Supply and erection of 144 concrete columns, and supply and fitting of 144 lanterns, lamps, auxiliary gear and wiring, under separate contracts for Class A street lighting. Borough Surveyor, College House. Deposit £2 for each contract.

Feb. 28.—Chadderton U.D.C. Supply of electric lamps for year ending March 31, 1952. Engineer and Surveyor, Town Hall.

Feb. 28.—Cheadle and Gatley U.D.C. Supply of electric lamps, standards and fittings for street-lighting purposes. G. P. Stanley, Engineer and Surveyor, Town Hall, Bruntwood, Cheadle. (See Feb. 15 issue.)

Feb. 28.—Dewsbury T.C. Supply of electric lamps, cable, 100-200 W lanterns with swan neck brackets, 300-500 W lanterns, c.i. steel and concrete lighting standards, paint, glass, uniform jackets, etc. Street Lighting Superintendent, 27 Battye St., Dewsbury. (See Jan. 25 issue.)

Feb. 28.—Huddersfield T.C. Supply of tungsten filament and mercury-vapour and sodium lamps, and electric cables, for year ending March 31, 1952. Offices of the Borough Engineer and Surveyor, High St. Bldgs.

Mar. 3.—Irlam U.D.C. Electric lamps included in list of annual supplies required for year beginning April 1. Engineer and Surveyor, Council Offices, Irlam, nr. Manchester.

Mar. 3.—Maesteg U.D.C. Electric wiring of 64 houses on Turbeville housing site. Engineer and Surveyor's Dept., Talbot St., Maesteg.

Mar. 3.—Rochester. Lighting of Cavendish Rd. is part of road works to be carried out there. City Surveyor, 66 Maidstone Rd., Rochester.

Mar. 3.—St. Austell (Corn.) R.D.C. Electrical work at "Traverna" in the conversion to offices. Council's Engineer is R. J. Goodwin. Deposit £3 3s.

Mar. 5.—S. W. Durham. Hospital Management Committee invites tenders for supply of electrical equipment during the year beginning April 1. The Supplies Officer, General Hospital, Bishop Auckland.

Mar. 5.—Littlehampton U.D.C. Electrical installation in 18 houses and 16 houses, under separate contracts on Wickbourne estate. Engineer and Surveyor, Council Offices, Littlehampton. Deposit £1 1s.

Mar. 5.—Stockport and Buxton. Hospital Management Committee requires supply of electric lamps. Supplies Officer, Admin-Offices, 59b Shaw Heath, Stockport.

Mar. 6.—East Riding. Supply of electric lamps required. Supplies Officer, County Hall, E. Beverley.

Mar. 7.—Dalkeith. Electrical work in 44 houses at Peaseflat. Documents from the Surveyors, Morham and Brotchie, 29 Hanover St., Edinburgh.

Mar. 7.—Dublin. Two complete sets of rectifier equipment, having output of 1,000 amp at 500 V. Also supply of one 400 kVA transformer for Port and Docks Board, Engineer's office, East Wall Rd., Dublin.

Mar. 7.—Edinburgh. Electric light and power installation in primary school at Old Saughton. City Architect, City Chambers.

Mar. 7.—Lewes T.C. Supply of cooker switches and hot plates wanted for year ending Mar. 31, 1952. Borough Surveyor, Town Hall.

Mar. 9.—Bournemouth. Installation of No. 2 electric lifts at Town Hall. Borough Architect, Town Hall. Deposit £2 2s.

Mar. 9.—Kilwinning T.C. Tenders invited for street lighting of Trunk Road A.78 with sodium vapour discharge lamps. Burgh Surveyor, Council Chambers, Kilwinning. (See Feb. 15 issue.)

Mar. 10.—Brighouse T.C. 130 concrete columns, 20 brackets for attachment to existing poles and 150 h.p. m.v. lanterns and fittings, for the Bradford-Huddersfield Road A.641. Borough Engineer, Commercial Street, Brighouse. Deposit £1.

Mar. 10.—Mablethorpe and Sutton U.D.C. Supply and erection of vertical spindle centrifugal pump driven by electric motor. Pump must be capable of lifting 20,000 g.p.h. Consulting Engineer, Silcock and Simpson, 10 Park Row, Leeds 1. Deposit £5.

Mar. 12.—Dublin. One 100/6G rectifier bulb for Hewittic mercury arc rectifier. Tenders to City's Vocational Education Committee, Town Hall, Merrion Rd., Ballsbridge, Dublin.

March 15.—Southampton. Electrical installation in Beech Ave. junior school. Applications to Borough Architect by Feb. 28. Deposit £5. (Advertised in this issue.)

March 16.—Belfast. Tenders invited for 6·6 kV and lower voltage cabling, with ancillary works. Electricity Dept., East Bridge St., Belfast. Deposit £2 2s. (Advertised in this issue.)

Mar. 19.—North of Scotland H.E. Board. Forty miles of 132 kV steel tower o.h. line, between Beauly and Shin. Apply to Strain and Robertson, 154 West George St., Glasgow, C.2. Deposit £2 2s. (See Jan. 25 issue.)

Mar. 23.—Coventry. Electrical installation in primary school at Alderman's Green. Applications to Consulting Engineers, Brandt and O'Dell, Grosvenor Gardens House, London S.W.1, by Mar. 2. (Advertised in this issue.)

Mar. 24.—Bradford. Supply and installation of new switchgear and wiring at Dumb Mills, Frizinghall, and dismantling and removal of redundant portions of existing switchgear. City Engineer and Surveyor. Deposit £2 2s. (Advertised in this issue.)

No date stated.—Falkland. Electrical work in 12 houses on Southfield site. Applications to A. D. Haxton and Watson, architects, Leven.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Mar. 7.—Capetown. Supply of 4,000 a.c. house service meters for Electricity Dept. Stores, N'Dabeni, Maitland. Documents from Capetown Electrical Engineer, Electricity House, Strand St., Capetown.

Mar. 9.—Turkey. Post, Telegraph and Telephones Dept. requires supply of 5,000 x 24 V and 6,000 x 48 V automatic telephones. Tenders to Directorate-General at Ankara.

Mar. 14. — Capetown. 5,000 yds of 3-core cable (0·25 sq in.) for working pressure of 12 kV; 7,000 yds combined 3-core pilot and 3-pr telephone cable, and 11,000 yds 4-core cable, both for working pressure of 660 V; 2,500 yds 10 pr 40 lb conductor telephone cable. Tenders to City Electrical Engineer, Electricity House, Strand St.

Mar. 16.—Thailand. Stores Division, Railways Dept., Bankok, wants 282 sets of telephone block instruments for "line clear."

Apl. 2.—Auckland (N.Z.). Electricity Power Board invites tenders for two 10,000 kVA transformers suitable for connection to 21,000 V system. B.o.T. (Ref.: CRE (IB) 53366/51)*.

Apl. 17.—Bloemfontein. Supply and erection at new power station of piping equipment, comprising high and low pressure pipework, tanks, boiler feed and service pumps. Consulting engineer, Merz and McLellan (S. Africa), Johannesburg. Deposit £2 2s.

Apl. 26.—Sydney. County Council invite tenders for supply of relays and associated equipment for a differential phase comparison busbar zone protective scheme for two groups of 132,000 V outdoor switchgear at Homebush substation. B.o.T. (Ref.: CRE (I.B.) 53622/51)*.

CONTRACTS PLACED

Carlisle. Electrical work at Belah primary school. David Thomson and Sons., Ltd., £2,015.

Newcastle-on-Tyne. Electrical installation in 98 houses on St. Anthony's estate. S. G. Meikle, £840.

Liverpool. Supply of fluorescent fittings for Walker Art Gallery, G.E.C., £2,267.

Your Queries — Answered

"Hetco" hairdryers, makers of? H.D.—Henry E. Taylor Ltd., 15A Queensway, Enfield. (19444)

Domestic ice-cream mixer with a 1-3 gallon capacity, makers of? A.B.—James H. Randall and Son, Ltd., 4 North Wharf Rd., W.2 state that their 2-gallon product should suit. (19449)

Synchronous motors $^1/_{10}$th to $^1/_{16}$th h.p., makers of? K.T.—Klaxon Ltd., 201 Holland Park Ave., W.11; Croydon Eng. Co., Ltd., Commerce Way, Croydon; Motor Electrics Co., 67 Chippenham Mews, W.9. (19452)

"Trilink" isolating link boxes, makers of? W.E.—Bill Switchgear Ltd., Aston Lane, Perry Barr, Birmingham 20. (19456)

The above are selected from questions we have answered this week. If you have a query, send it to us.

TRADE NOTES

Acquisition. We understand that the business of Krivert Ltd. has been acquired by Belark Tool and Stamping Co. Ltd., 33 Sussex Place, W.2.

The business of Hirst Electrical Co. has been taken over and is being carried on by Hirst Electronic Development Ltd.

Agents. Everett, Edgcumbe and Co. Ltd., have appointed Aberdare Electric Co. Ltd., of Aberdare Works, Finglas, Co. Dublin, as their agents in Northern Ireland and the Republic of Ireland.

Change of Title.—To avoid confusion, the name of the Standard Electrical Engineering Co. has been changed to K. L. B. Electric Ltd. The company are also discontinuing the use of the mark "Stanelect" on certain products. As a result of a recent reorganisation Mr. W. J. H. Lambert has retired from the board, and the company will continue its normal business under the control of Mr. A. Strath.

Extension. The head offices of the Wakefield Oil Co. will shortly be extending into the adjoining building vacated by the fashion house of Molyneux.

New Depots. Bill Switchgear Ltd. have opened a Scottish Area Depot at 156/158, St. Vincent Lane, Glasgow, Telephone Central 0960, in the charge of their Scottish area manager, Mr. J. D. Harris.

Brookhirst Switchgear Ltd. have opened a Newcastle Office at Lloyds Bank Chambers, 15 Sandhill, Quayside, Newcastle-on-Tyne, 1, with Mr. T. G Evans as district manager. Mr. Evans will be responsible for the Company's interests in Northumberland and Durham.

New Phone No. The telephone number of the Norwich branch of British Insulated Callender's Cables Ltd. is now Norwich 21526.

Rearrangement.—Thomas De La Rue and Co., Ltd., announce that to facilitate the operation of their industrial group, their wholly-owned subsidiary company, De La Rue Extrusions, Ltd., has been placed in voluntary liquidation and its assets and liabilities taken over by the parent company. The business will in future operate under the Plastics Division of Thomas De La Rue and Co., Ltd.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	202 0 0	£196 0 0
Delivered in 2nd and 3rd month after order ...	215 10 0	—
Delivered in 4th, 5th and 6th month after order	217 0 0	—
LEAD, good soft pig (foreign)	136 0 0	136 0 0
" " " "English" quality	137 10 0	
Delivered in 2nd and 3rd month after order, plus	7 0 0	
TIN (99-99.75%) ... ...(Cash)	1515-1520	—
" (3 months)	1450-1455	—
ALUMINIUM, commercial purity (del.) ...	124 0 0	—
ZINC	151 0 0	140 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	45 10 0	—
Mild Steel Tape (0.04 in.)	26 0 0	—

GAZETTE ANNOUNCEMENTS

PRIVATE ARRANGEMENT

G. E. Collinge, trading as G. E. Collinge and Co., wholesale electrical suppliers, 37 Buxton Rd., Whaley Bridge, Cheshire. Liabilities amounted to £4,260 and assets were estimated to produce £1,828, leaving deficiency of £2,432. It has been resolved that debtor execute a deed of assignment in favour of Arthur T. Eaves, of Harry L. Price and Co., 47 Mosley St., Manchester 2, trustee of the estate. Committee of Inspection was also appointed.

COMPANIES ACTS

Peerless Refrigeration Ltd. Petition for winding-up presented at High Court of Justice on Feb. 8, and is directed to be heard on Feb. 26. Persons should communicate with Linklaters and Paines, Austin Friars House, 6 Austin Friars, E.C.2.

Serv-ice (Leeds), Ltd., refrigeration engineers, have appointed George Hampshire Scott, 10 Park Square, Leeds 1, as liquidator.

Southern Electric Equipment Co. (Hove) Ltd. Meeting of creditors to be held at offices of A. E. Orbell and Co., Certified Accountants, 7 Old Steine, Brighton 1, on Feb. 26, at 3.15 p.m.

First Meeting

London. Malden-Brown (Electronics) Ltd., 9 Spring Grove, Loughton, Essex. Meetings of creditors and contributories to be held on Feb. 22 at Inveresk House, Strand, W.C.2, at 11.30 a.m. and 12 noon.

BANKRUPTCY ACTS

Intended Dividends

London. Leslie Bloom, trading in partnership as "Bloom Bros." electrical engineers, at 12 Duke St., St. James's. Last day for receiving proofs, Feb. 28. Trustee is Wm. Foy Cresswell, Bankruptcy Bldgs., Carey St., W.C.2.

London. Hyman Gold, trading as "Radio and Electric Service," at 193 Mare Street, Hackney, and "Goldway Electronics," at 141 Park Road, N.W.8. Last day for receiving proofs, March 5. Trustee is A. W. Hunter, 185-188 High Holborn, W.C.1.

Receiving Order

Hereford. Philip Thomas, radio and electrical engineer, trading at 4 New Street, Ledbury. Date of receiving order, Feb. 10.

Dividends

Salford. Arthur Smith and James Smith, trading as "J. and A. Smith," electrical contractors, at 550 Bolton Rd., Pendlebury. First and final dividends of 1s. 5d. in £ payable on Feb. 20.

Companies Winding-up

Rentalec Ltd., of London, W.1, dealers in electrical equipment. It was announced at the first meeting of creditors that winding-up order was made on January 15. Company formed in Feb., 1949, with capital of £100. The sale of fluorescent fittings on H.P. was started but had to be discontinued later when it was decided to go in for electrical contracting. Substantial contracts were negotiated with the Pakistan Government for installation work, and the cash book showed that over £14,000 was received from that source. The company appeared to have advanced moneys totalling some £2,294 to another concern, of which £520 had been repaid. Book debts amounted to some £200, most of which were in dispute and other assets were estimated to realise £50. All that was known of the liabilities was that they exceeded £2,000, excluding sums that may be due to a director. No resolution was passed and the matter was left in the hands of Official Receiver as liquidator.

BUSINESS PROSPECTS

Abingdon (Berks.) R.D.C. Plans approved for erection of 46 houses and 12 bungalows on Lamborough Hill site, Wootton.

Airdrie (Lanark.) T.C. Construction of 100 houses at Craigneule.

Basingstoke (Hants.) R.D.C. Application to be made for sanction to borrow £59,100 for erection of 51 dwellings at Bramley.

Battle (Sussex) R.D.C. It is proposed to build 31 houses at Icklesham Village and 30 on various other sites.

Birmingham. Plans approved for erection of secondary modern school at Shard End, two-form entry at Perry Bar and R.C. school at King's Heath.

Bridgnorth (Shrop.) R.D.C. It is proposed to erect 32 houses on five sites.

Brighton T.C. Erection of 85 houses on Parkside extension, Cordean. Borough Engineer and Surveyor, 26-30 Kings Road.

Brixworth (Northants) R.D.C. Council expects to construct a total of 62 houses on various estates.

Burton Latimer (Northants) U.D.C. Application to be made for sanction to borrow £29,905 for erection of seven blocks of flats.

Camberwell. Erection of 60 flats in five blocks on Cleve Hall estate, and 40 flats in two blocks at Herne Hill. S. J. Harvey, acting Town Clerk, Town Hall, Peckham Rd., S.E.5.

Deal (Kent) T.C. Erection of 44 houses and 16 flats on Orchard Ave. estate. Borough Engineer, Municipal Offices, Queen Street.

Dumbarton. Western Regional Hospital Board is to build a hospital near the Henry Brook Vale of Leve Hospital, Alexandria. Also, Dean of Guild Court has approved erection of R.C. church in Cordross Road.

Durham. County E.C. is to spend £3,000 on renewal of electrical installation at Shiney Row county school, and a similar amount on installations at Horden Colliery county and Horden Girls' modern school. County Architect, Court Lane. Also City Council has applied for permission to carry out £9732 scheme for installing electricity in 336 houses, and is to spend £2,192 on street lighting at Quarry Heads Lane.

Edinburgh. Dean of Guild Cour. has approved plans for erection of 130 houses at Kings Knave Road.

Exmouth U.D.C. Council seeks approval to carry out improvements to the Theatre Royal, Exeter. Estimated cost is £10,000.

Frome (Som.) R.D.C. Plans approved for erection of 31 houses on Nunney housing site.

Greenwich. Construction of 48 flats on Cherry Orchard site, Charlton. Borough Engineer and Surveyor, Town Hall.

Guildford T.C. Tenders likely to be invited for erection of 100 houses at Bushey Hill.

Hinckley (Leic.) U.D.C. Proposals lodged for erection of 92 houses and 6 shops on Sketchley Hill estate and 27 houses on three other sites.

Holtwhistle R.D.C. 54 houses are to be built at Halton-lea-Gate as a start in the development of a new mining village.

Hornsey. Junior school is to be built on Rokesly site and a secondary modern school at Creighton Ave.

Inverness. Dean of Guild Court has approved Scottish Special Housing Association's plans for building of 80 houses.

Kent. Following school building programme has been approved: junior and infants school at Folkestone, secondary at Herne Bay, infants schools at Nonington Aylesham and Minster-in-Sheppey, and secondary at Maidstone South.

Kilmarnock. T.C. proposes to build 150 houses as part of development at Outbank Farm. Estimated cost £180,000.

Lewisham. B.C. recommended to invite tenders for various works, including lighting, in library at Grove Park.

Liverpool. Construction of 17 houses in Kensington area, 31 in Princes Park area, and 10 on two sites in Coylands St. Also of 32 houses on various sites. City Architect and Director of Housing, Blackburn Chambers, Dale St., Kingsway, Liverpool 2.

Maidenhead T.C. Tenders to be invited for erection of 44 houses on Larchfield estate.

Middleton (Lancs.) T.C. Construction of 90 houses on Acresfield Rd. site. J. Pollard, Borough Architect, Town Hall.

Nelson T.C. Application to be made for sanction to borrow £42,823 for erection of 18 houses on Marsden Park estate and 16 on Holehouse estate.

Newton Aycliffe. The Aycliffe Development Corp. proposes to build 180 houses. Plans by N. Robson and Sons, Station Chambers, Bishop Auckland.

Pembrokeshire. Erections of Tavernspite new county primary and Pembroke Dock grammar school. Tenders due March and April resp. Names to County Architect, County Offices, Haverfordwest, as soon as possible.

Radcliffe T.C. to apply for sanction to borrow £52,821 to build 48 houses on Wordsworth Ave. site.

Sunderland. 346 dwellings are in the course of erection on Hylton Red estate. Borough Architect's Office, Grange House Stockton Road.

Weardale R.D.C. Erection of 24 houses at Wolsingham and 20 at Frosterley. Architect is J. J. Eltringham, Derwent St., Blackhill.

OVERSEAS

Israel. Mr. Erich Braun, manager, Israel Hotel Builders Co., Ltd., wishes to obtain catalogues from U.K. suppliers and manufacturers of modern equipment for a luxury hotel. Firms should write direct to Mr. Braun c/o The Armon Hotel, 90a Hayathon St., Tel Aviv.

Mexico. Mr. Murray-Campbell of Cia. Mercantil Campbell S.A., Popocatepetl 131, Mexico, D.F., is interested in importing television receivers from the U.K., provided he can obtain necessary permits. Interested firms should communicate direct.

Nicaragua. Carlos Halder La Suiza, 3a Calle N.E. No. 205, Managna, wishes to act as agent for electrical household appliances and apparatus, and transformers.

Persia. Trafico Trading Co. Inc., Avenue Saadi, Tehran, wish to represent U.K. manufacturers of radios and electrical domestic appliances.

S. Africa. Notnyphon of S. Africa (Pty) Ltd., 15 Moseley St., Doornfontein, Johannesburg, wants to buy in approximate annual quantities, 20,000 switches, 100,000 yds of heater cord and 5,000 lb of ni-chrome resistance wire.

U.S.A. Quotations for rheostats to control speed of fractional (¾ h.p.) motors used in sewing machines wanted by Mississippi Products Inc., Livingston Rd., Jackson, Mississippi.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Conambond. 694,173, and **Conybond.** 694,172. Class 9. Insulated electric wires and cables. Connollys (Blackley) Ltd., Blackley Vale Mills, Blackley, Manchester.

John Croal, with design. 693,101. Class 11. Electrical installations for lighting, heating, cooking, etc. J. Croal, 54, Broughton St., Edinburgh 1.

Mutemp. 694,113. Class 5. Common metal alloys for use in the temperature compensation of electrical measurement devices. Richard Thomas and Baldwins Ltd., 47 Park St., London W.1.

Sturdex. 692,414. Class 9. Electrical apparatus and fittings therefor. J. A. Crabtree and Co., Ltd., Lincoln Works, Lincoln Rd., Walsall, Staffs.

Velotrol with design. 692,467. Class 9. Electric current rectifiers. Hackbridge and Hewittic Electric Co., Ltd., Hersham Lodge, Walton-on-Thames.

Vigilux. 694,408. Class 9. Electrically heated blankets. Warm-Glow Co. Ltd., 1133 London Rd., Leigh-on-Sea.

MEETINGS TO NOTE

THURSDAY, FEB. 22

I.E.S. (Bradford Group).—"Sight and Light." J. Benson. Yorks Elect. Board, Sunbridge Rd., Bradford, 7.30 p.m.

I.E.E. (London).—Annual dinner at Grosvenor House, Park Lane, 7 p.m.

A.S.E.E. (Luton Branch).—"Flowmeters." George Hotel, George St., 8 p.m.

FRIDAY, FEB. 23

I.E.E. (Southern Centre).—"Magnetic Amplifiers." A. G. Milnes. Technical College, Weymouth, 6.30 p.m.

MONDAY, FEB. 26

I.E.E. (N.E. Centre).—"Transients in Electric Mine Winders and Their Effects on Rope Stresses." T. H. Petch. Neville Hall, Westgate Rd., Newcastle, 6.15 p.m.

I.E.E. (N.W. Centre).—"Metallurgical Research at the Manchester University." Prof. F. C. Thompson. Engineers' Club, Albert Sq., Manchester, 7 p.m.

I.E.E. (S. Midland Radio Group).—"Fifty Years' Development in Telephone and Telegraph Transmission in Relation to Work of Oliver Heaviside." W. G. Radley. James Watt Memorial Inst., Gt. Charles St., Birmingham, 6 p.m.

I.E.E. (Western Utilisation Group).—"Notes on Electrical Installations in Large Chemical Factories." D. B. Hogg. S. Wales Inst. of Engineers, Park Pl., 6 p.m.

TUESDAY, FEB. 27

I.E.E. (London Measurements Section).—Discussion on "Electrical Measurement by Thermal Effects." Savoy Pl., W.C.2, 5.30 p.m.

I.E.E. (Scottish Centre).—"Electrical Methods of Measuring Mechanical Quantities." F. J. Woodcock. Inst. of Engineers and Shipbuilders, 39 Elmbank Cres., 7 p.m.

WEDNESDAY, FEB. 28

I.E.S. (London).—Discussion on "Assessment of Lighting: Instruments on Instinct." Lighting Service Bureau, 2 Savoy Hill, W.C.2, 6 p.m.

I.E.E. (Mersey and N. Wales Centre).—Faraday lecture on "Lamps and Lighting—A Record of Industrial Research." L. J. Davies. Philharmonic Hall, Hope St., Liverpool, 6.45 p.m.

I.E.E. (Southern Centre).—Report on "Education and Training of Electrical Technicians." W. N. C. Clinch. Technical College, Brighton, 6.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (W. Midlands Section).—"Power Rectifiers." J. C. Milne. Tech. College, Wulfruna St., Wolverhampton, 7 p.m.

THURSDAY, MARCH 1

I.E.E. (London).—"London-Birmingham Television Radio-Relay Link." R. J. Clayton, D. C. Espley, G. W. S. Griffiths and J. M. C. Pinkham. Savoy Pl., W.C.2, 5.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (N.W. Section).—"Survey of Television Development and its Problems." H. J. Barton-Chapple. Coll. of Technology, Manchester, 7.15 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Merseyside Section).—"Use of Foster's Theorem in Circuit Design." F. Williams. Elect. Service Centre, Whitechapel, Liverpool, 7 p.m.

I.E.S. (Exeter Group).—"Illumination and Illusion." P. Hartill. Agricultural House, Queen St., 7 p.m.

INCORP. PLANT ENGRS. (Peterborough Branch).—"Discharge Lighting." Eastern Gas Board 7.30 p.m.

FRIDAY, MARCH 2

BIRMINGHAM ELECT. CLUB.—Annual dinner at Grand Hotel, 6.30 p.m.

I.E.E. (N. Staffs sub-centre).—Annual dinner and visit of President. Crown Hotel, Stone, 7 p.m.

I.E.S. (Bath and Bristol Centre).—"Illumination and Illusion." P. Hartill. S.W. Elect. Board, Bath, 7 p.m.

INSTN. OF WORKS MANAGERS (Notts and Derby Branch).—"Is Management an Art or a Science?" J. Ayres of Brush Elect. Eng. Co. Midland Hotel, Derby, 7.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

R. Allen (Refrigeration) Ltd., 274 Westgate Rd., Newcastle-on-Tyne 4. Manufacturers of and dealers in refrigerators, and cold storage plant, etc. Cap.: £5,000. Dirs.: R. Allen and J. Sampson.

R. Hipkiss and Sons, Ltd. Tube and tube fittings, conduit tube and fittings manufacturers, ironmasters, founders and workers, etc. Cap.: £1,000. Permanent dirs.: R. Hipkiss and Mrs. M. M. Hipkiss.

Neon Displays Ltd. Office: 58, 46 Fenwick St., Liverpool 2. Neon and electric sign makers and erectors, etc. Cap.: £100. Permanent dirs.: W. B. Johnson and E. W. Kershaw Booth.

Perseus Manufacturing Co., Ltd., St. Matthews Bldgs., Branstone Rd., Burton-on-Trent. To take over business of manufacturers and factors of electrical and radio apparatus carried on by the administratrices of Arthur L. Dumelow as "Perseus Mfg. Co.," and to carry on business of manufacturers of and dealers in toys, models and games, etc. Cap.: £5,000. Dirs.: Dorothy A. Dumelow, Doris Whitely, J. M. Whitely, W. A. Dumelow and R. L. Dumelow.

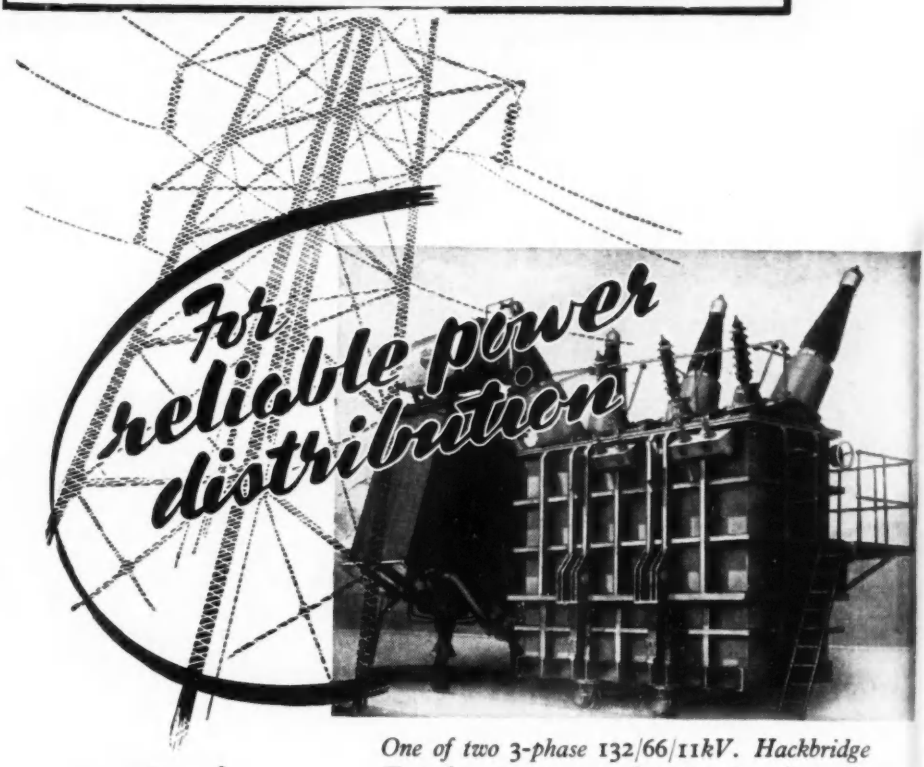
P.T. Electrical Development Co., Ltd., 70 High St., Skegness. Mechanical, electrical and general engineers, etc. Cap.: £5,000. Dirs.: A. M. Thorpe, F. Parsons, Irene M. Parsons and Alice R. Thorne.

R.B.S. (Capacitors) Ltd. Manufacturers of and dealers in electrolytic and all other types of condensers, etc. Cap.: £3,000. Dirs.: A. P. B. Renshaw, 4 Park View Rd., W.5; F. Stringer, 26 Ealing Park Gdns., W.5; A. H. B. Brodrick, 29 Hyde Way, Hayes, Middlesex.

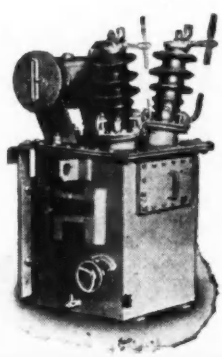
Rushlite Battery Co., Ltd., 54 Temple St., Wolverhampton. Manufacturers of and dealers in electrical accumulators, batteries, etc. Cap.: £10,000. Permanent dirs.: E. J. L. Cotton and H. L. Malec.

Wilson Electric (Battersea) Ltd., 158 Falcon Rd., S.W.11. Manufacturers of and dealers in electric motors, dynamos, etc. Cap.: £1,000. Dirs.: C. F. Wilson and W. A. Lock.

HACKBRIDGE TRANSFORMERS



One of two 3-phase 132/66/11kV. Hackbridge Transformers at a substation in Australia

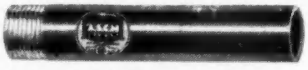


HACKBRIDGE Transformers are backed by long and varied experience in the design and manufacture of transformers of every type, size and voltage—for supply, distribution and industrial applications. Also on-load voltage regulating equipment, reactors, arc-suppression coils and high-grade instrument transformers.

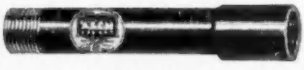
HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY

Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric," Walton-on-Thames

"It's no trouble at all!"



Screwed & Socketed Gas Thread



Screwed & Socketed Conduit Thread

Light Gauge Tube

How often one hears that remark but how *true* it is when you are working with Metallic Conduit Tube and Fittings. For quality and consistent accuracy—

SPECIFY METALLIC

CONDUIT TUBE & FITTINGS

A TI COMPANY

THE METALLIC SEAMLESS TUBE Co. Ltd., Ludgate Hill, BIRMINGHAM 3. Tel. CEN 7167
Also at London, Newcastle-on-Tyne, Leeds, Swansea and Glasgow

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CITY OF COVENTRY EDUCATION COMMITTEE

Primary School, Aldermans Green, Coventry

ELECTRICAL INSTALLATION

TENDERS are invited for the electrical installation for a 320-place Primary School and Caretaker's House at Aldermans Green, Coventry.

Contractors wishing to tender should make application to the Consulting Engineers, Messrs. Brandt and O'Dell, of Grosvenor Gardens House, London S.W.1, not later than March 2, 1951.

A specification of work will be issued on or about March 8, 1951.

Drawings and form of contract may be seen either at the offices of the Education Authority in Coventry or the Architects, Messrs. Arcon of 81 Piccadilly, London W.1, or the Consulting Engineers.

Sealed tenders, in the envelopes provided, should be sent to the Consulting Engineers to arrive not later than March 23, 1951.

The lowest or any other tender will not necessarily be accepted and contractors tendering do so at their own expense.

W. L. CHINN,
Director of Education.

The Council House,
Coventry. (H 738)

CITY OF BRADFORD

DUMB MILLS, FRIZINGHALL, BRADFORD
MODIFICATION OF ELECTRICAL WIRING

THE Council invites tenders for the dismantling and removal of the redundant portions of the existing switchgear and wiring, and the supply and installation of new switchgear and wiring at Dumb Mills, Frizinghall, Bradford, the property of the Corporation.

The drawings, specifications, bill of quantities and form of tender may be obtained at the office of the City Engineer and Surveyor any time during normal office hours on payment of a deposit of two guineas which will be refunded on return of contract documents and submission of a bona fide tender not subsequently withdrawn.

Tenders, sealed and endorsed "Tender for Modification of Electrical Wiring—Dumb Mills" must be delivered in the envelope provided, to the undersigned not later than Saturday, March 24, 1951.

The Council do not bind themselves to accept the lowest or any tender.

W. H. LEATHEM,
Town Clerk.

Town Hall, Bradford. (H 690)

CITY OF BELFAST

CABLING

TENDERS are invited for 6·6 kV and lower voltage cabling, with ancillary works.

Form of tender and specification (No. G.158) may be obtained at the Electricity Department, East Bridge Street, Belfast, on payment of a deposit of two guineas (cheques to be made payable to the Belfast Corporation Electricity Department), which deposit will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies may be obtained at one guinea each, which sum will not be returnable.

Each tender, in sealed envelope marked "Tender for Cabling, Electricity Department," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, March 16, 1951.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast. (H 716)

COUNTY BOROUGH OF SOUTHAMPTON

TO ELECTRICAL CONTRACTORS

TENDERS are hereby invited for the electrical installation to Beech Avenue Junior School.

Application to tender must be accompanied by a deposit of £5, or the Borough Treasurer's receipt for same, and must be addressed to, and reach, the Borough Architect not later than February 28, 1951.

The form of tender and specification and drawings, together with supplemental conditions of contract will be forwarded to contractors who have applied as above.

The electrical contractor will be required to enter into a sub-contract with the Main Contractor in accordance with the conditions of the main contract.

The main contract will be the current form issued under the sanction of the Royal Institute of British Architects plus supplemental conditions and will be available for inspection at the Borough Architect's office.

Deposits will be returned on receipt of a bona-fide tender (not subsequently withdrawn) or on return of the documents.

Tenders, on the form and in the official envelope provided, must be addressed to the Borough Architect, and delivered not later than 10 a.m. on March 15, 1951.

R. RONALD H. MEGGESON,
Town Clerk.

Civic Centre,
Southampton. (H 729)

APPOINTMENTS VACANT

CITY OF BULAWAYO, SOUTHERN RHODESIA

VACANCY: GENERATION ENGINEER

GROSS EMOLUMENT: £1,225 RISING TO £1,395, PLUS CHILDREN'S ALLOWANCES

APPLICATIONS are invited from Chartered Engineers, preferably Corporate Members of the Institution of Mechanical Engineers, for the above vacancy, which involves responsibility to the City Electrical Engineer for the efficient maintenance and operation of the Council's two Power Stations with plant of 88.5 MW combined capacity including installations on order and under erection, the major portion of which operates at 635 p.s.i. and 850 deg. total temperature.

Applicants should, apart from possessing the above minimum qualifications, have had satisfactory training and experience in modern power station practice.

The commencing gross emolument will be £1,225 5s. rising by four annual increments to £1,394 13s. plus children's allowances. This is based on a salary scale of £1,108 16s. by £43 4s. to £1,281 12s. plus a variable cost of living allowance at present fixed at a rate of £92 9s. at the commencement of the grade and £89 1s. at the top of the grade, plus a stand-by allowance of £2 a month. Children's allowances of £30 per annum for the first child and £24 per annum for each of the next two children will also be payable.

In Southern Rhodesia the income tax payable by the successful applicant, if married and with two children, is at present approximately £10 per annum on a total initial emolument of £1,279 per annum.

A house will be available on the power station site at a rental of £5 a month, but the successful applicant may make private arrangements for accommodation should he so desire. The successful applicant, after a satisfactory probationary period of twelve months, will, if under the age of 45 years, be required to join the pension fund, on obtaining a satisfactory certificate from the Council's medical officer of health.

Applications, giving full personal and professional details, and accompanied by one unmounted photograph, should be sent by airmail so as to reach the undersigned by not later than noon on Friday March 16, 1951.

H. J. COOK,
Town Clerk.
(H 706)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the position of GENERAL ASSISTANT ENGINEER (Construction) in the Generation Construction Department.

The successful applicant will be required to act as Assistant to the Site Engineer at the Northampton Power Station.

Applicants must hold the Higher National Certificate in Electrical Engineering, or be Graduate Members of the I.E.E., and should preferably have had workshop training.

Salary and conditions of service will be in accordance with the National Joint Board Schedule, Class "AX" (8) commencing at £437 per annum.

The post is superannuable within the provisions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Forms of application, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham, should be returned not later than Monday, March 12, 1951.

W. S. BURGE,
Divisional Controller.

February 16, 1951. (H 721)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of ASSISTANT ENGINEER (Mains) in District 347 (Cardiff) in the Central Sub-Area of the Board.

The duties will include all types of mains work on voltages up to 33 kV.

Preference will be given to applicants who possess an engineering degree of a British University, the Higher National Certificate or its equivalent, or have passed the Graduateship Examination of the Institution of Electrical Engineers.

The salary for the position will be in accordance with Class "F", Grade 7 (£625/£634/£643) of the National Joint Board Schedule for the electricity supply industry.

Applications, stating age, present position, present salary, qualifications and experience, and whether married or single, together with the names and addresses of three referees, should be addressed to the Secretary (Establishments), The South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him not later than March 3, 1951.

D. G. DODDS,
Secretary.
(H 726)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the position of THIRD ASSISTANT ENGINEER (Civil) in the Generation Construction Department. The post will be located at the Northampton Power Station.

Applicants must be chartered Civil Engineers or hold other equivalent qualifications, and should be experienced in the design and supervision of Civil Engineering works.

Salary and conditions of service will be in accordance with Class "AX/DX," Grade 5 of Schedule "C" of the National Joint Board Agreement (£579 to £776 per annum).

The post is superannuable within the provisions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Forms of application, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham, should be returned not later than Monday, March 12, 1951.

W. S. BURGE,
Divisional Controller.

February 16, 1951. (H 722)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of GENERAL ASSISTANT ENGINEER (Mains Testing) in the Central Sub-Area of the Board based on Cardiff.

The successful applicant will be required to assist in carrying out high voltage tests on feeders and switchgear and in localising mains faults in the whole Sub-Area.

Preference will be given to applicants who possess an engineering degree of a British University, the Higher National Certificate or its equivalent, or have passed the Graduateship Examination of the Institution of Electrical Engineers.

The salary for the position will be in accordance with Class "K", Grade 13 (£515/£526/£537) of the National Joint Board Schedule for the electricity supply industry.

Applications, stating age, present position, present salary, qualifications and experience, and whether married or single, together with the names and addresses of three referees, should be addressed to the Secretary (Establishments), The South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him not later than March 3, 1951.

D. G. DODDS,
Secretary.
(H 728)

SOUTHERN ELECTRICITY BOARD

APPLICATIONS are invited for the following post:—
ASSISTANT ENGINEER (PLANNING)
Portsmouth District of No. 3 (Portsmouth) Sub-Area.

Provisional salary £525 per annum, subject to adjustment. Conditions of Service as prescribed from time to time.

Candidates should have experience of and ability to prepare proposals and estimates for extensions of h.v. and l.v. networks and substations and to deal with preliminary work prior to construction. Preference will be given to applicants holding a University degree or equivalent qualification. The appointment will involve standby duties.

The successful candidate for this appointment will be required to contribute to the B.E.A. and Area Boards' superannuation scheme, if eligible.

Candidates who have already responded to a previous advertisement of this vacancy need not apply again.

Applications, on forms obtainable from Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, should be returned to him not later than 14 days after the appearance of this notice.

F. W. KEMPTON,
Secretary.
(H 720)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the appointment of ASSISTANT QUANTITY SURVEYOR (Temporary) at the Uskmouth Generating Station Site, near Newport, at a salary of £500-£600 per annum according to age and experience. The salary is provisional and subject to negotiation through the appropriate national machinery. Consideration will be given to the payment of travelling or subsistence allowance to the successful applicant. Applicants should be capable of checking interim and final measurements in accordance with the priced bill of quantities for inclusion in the contractor's statement, and preference will be given to those who have passed the intermediate examination of an appropriate professional institute.

Forms of application may be obtained from the Divisional Secretary's Office at the address below to whom completed applications should be returned not later than March 5, 1951.

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport,
Cardiff. (H 709)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of METER REPAIRERS in the Liverpool, Birkenhead and Chester Districts.

Applicants should have a sound technical and practical training in the repair of all types of meters and instruments, and preference will be given to those also possessing a knowledge of calibration and testing.

The present rate of pay is 33.5 pence per hour for a 44-hour, 5-day week, conditions being those of the National Joint Industrial Council for the Electricity Supply Industry.

Applications, giving full details of training and experience, should be forwarded to the Sub-Area Manager, Merseyside and North Wales Electricity Board as follows. In respect of the Liverpool district to 24 Hatton Garden, Liverpool 3, and in respect of the Birkenhead and Chester districts to Electricity House, Newgate Street, Chester, so as to be received not later than March 5, 1951.

JAMES RANKIN,
Secretary.
(H 725)

BRITISH ELECTRICITY AUTHORITY

London Division

ENGINEERING DRAUGHTSMAN—
WEST HAM GENERATING STATION

APPLICATIONS are invited for the above position from candidates who have had a good training in connection with power station maintenance.

The salary, which is provisional and subject to negotiation with the appropriate organisation, will range from £400 to £500 according to qualifications.

The appointment will be superannuable under the terms of the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within seven days of the appearance of the advertisement.

J. N. WAITE,
Divisional Controller.
(H 717)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

SUB-AREA COMMERCIAL OFFICER

APPLICATIONS are invited for the post of Commercial Officer in the Lothians Sub-Area. The person appointed will be responsible for the organisation and development of all commercial activities in the Sub-Area.

Applicants should be corporate members of the Institution of Electrical Engineers and should have had wide experience in the commercial development of electricity supply, particularly in a rural area; the control of service centres, sales and staff; the preparation of specifications and estimates for wiring installations; and the control of an electrical contracting department. A knowledge of the principles and practice of illumination and heating of buildings is desirable, and competency to advise consumers regarding tariffs is essential. The provisional salary is £850, and is subject to negotiation with the appropriate organisation. The appointment is superannuable and may be subject to medical examination.

Applications, in writing, stating age, and giving full details of education, qualifications, training and experience, should be received by the Manager, Lothians Sub-Area, South East Scotland Electricity Board, Musselburgh, within 14 days. (H 714)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

APPLICATIONS are invited for appointments as ENGINEERING DRAUGHTSMEN (Electrical) in the Generation (Construction) Department, Southern Group, Rotherham.

Applicants should be capable of carrying out technical calculations and have knowledge of construction or manufacture to enable them to complete under regular supervision final or working drawings.

The commencing salary will be within the range £375-£475 per annum which should be regarded as provisional, pending the settlement of final scales by such organisations as are appropriate.

The appointment will be subject to the provisions of the authority's superannuation scheme.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds 7, to whom completed forms should be returned within 14 days of the appearance of this notice. Envelopes to be endorsed " Engineering Draughtsman (Elec.)."

G. A. VOWLES,
Divisional Controller.
(H 705)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

THIRD ASSISTANT ENGINEER—GENERATION OPERATION DEPARTMENT

APPLICATIONS are invited for the position of Third Assistant Engineer in the Generation (Operation) Department, Headquarters, Nottingham.

Salary and conditions of service will be in accordance with Class "AX/DX," Grade 5 of Schedule C of the National Joint Board Agreement (£579 to £776 per annum).

The post will be superannuable within the provisions of the British Electricity Authority and Area Boards' superannuation scheme.

Applicants should have received a thorough technical and practical training in generating station operation, and should have had some administrative experience.

Candidates should have educational and technical qualifications up to the standard required for associated membership of the Institute of Electrical Engineers.

Applications should be submitted on the official form, which can be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham, and should be returned not later than Monday, March 12, 1951.

W. S. BURGE,
Divisional Controller.
(H 723)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of an ASSISTANT in the Purchasing Department at the Head Office of the Board, St. Mellons, Cardiff. The duties will entail the purchasing of general power engineering apparatus, particularly E.H.V. switchgear, transformers O/H line equipment and cables. Experience in the checking of quotations is desirable. The salary for the position will be in accordance with Grade 5 (£570/£640) of the National Joint Council (Administrative and Clerical Grades) for the Electricity Supply Industry.

Applications, stating age, qualifications and experience, present position, present salary, and whether married or single, together with the names and addresses of three referees, should be addressed to the Secretary (Establishments), The South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him not later than March 3, 1951.

D. G. DODDS,
Secretary.
(H 713)

BRITISH ELECTRICITY AUTHORITY

South Western Division

STATION SHIFT CONTROL ENGINEER—FEEDER ROAD POWER STATION

APPLICATIONS are invited for the position of Station Shift Control Engineer at Feeder Road Power Station, Bristol.

Applicants should possess good technical qualifications, and have had sound technical training and practical experience in the control and operation of steam generating plant and main switchgear.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Class "E," Grade 10, £488 to £502 per annum.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, qualifications, experience, present appointment and salary, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than March 1, 1951.

R. C. BARRETT,
Divisional Secretary.
February 12, 1951. (H 697)

LONDON ELECTRICITY BOARD

ENGINEER (OPERATION AND MAINTENANCE)

APPLICATIONS are invited for the above position in the Walthamstow district of the North-Eastern Sub-Area.

Applicants should have had a sound technical education up to at least Higher National Certificate standard, and possess good practical experience in general mains work, including the installation and maintenance of h.v. and m.v. distribution systems, static and rotary substations, and the preparation of the associated mains records.

The post has been graded under the National Joint Board agreement of February 17, 1950, as Class "E," Grade 6, £658 7s. per annum, rising to £681 9s. per annum, inclusive of London Area Allowance. This grading is subject to the approval of the District Joint Board and confirmation by the National Joint Board.

Application forms obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be completed and returned within seven days. Please enclose addressed envelope and quote Ref. EST/V/1153.T on envelope and all correspondence. (H 696)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the position of INSTRUMENT ENGINEER in the Chief Testing Engineer's Department. The salary for this position, which has yet to be negotiated by the National Joint Board, will provisionally be £517 per annum.

The successful applicant will be responsible to the Chief Testing Engineer for the efficient maintenance of all types of instruments associated with boilers and turbines, other than purely electrical instruments used in connection with electrical energy produced or consumed, at the Walsall, Birchills, Wolverhampton and Ocker Hill group of power stations. Candidates must have had experience in the operation and maintenance of "Multelec" Superheat Controllers, Conductivity and CO_2 recorders, and preferably with Lockheed-type electro-hydraulic fan operating gear. Applicants should hold Higher National Certificate in Electrical or Mechanical Engineering, or an equivalent qualification.

Conditions of service will be in accordance with the N.J.B. Agreement, and superannuation under terms approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and should be returned not later than March 10, 1951.

F. W. LAWTON,
Divisional Controller.
(H 731)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the position of EDUCATION TRAINING AND WELFARE OFFICER at Divisional Headquarters, at a salary within the range of Grade 8 of the National Joint Council Agreement, £795 to £900 per annum.

Candidates should have experience in the organisation and administration of training schemes for craftsmen, technical, clerical and administrative staff. Teaching experience will be considered an advantage.

Salary and conditions of service will be in accordance with the N.J.C. Agreement, and superannuation under terms approved by the British Electricity Authority.

Forms of application may be obtained from the undersigned at 53 Wake Green Road, Moseley, Birmingham 13, and should be returned not later than March 17, 1951.

H. N. WILSON,
Divisional Secretary.
(H 730)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following posts in the Transmission Department at Divisional Headquarters:—

(*a*) THIRD ASSISTANT ENGINEER (Construction Section)

(*b*) THIRD ASSISTANT ENGINEER (Maintenance Section)

Salaries in accordance with the N.J.B. Schedule, Grade 5, Class "AX" (£579 to £710 per annum plus London Weighting).

Applicants for appointment (*a*) should have served an apprenticeship and should possess the Higher National Certificate in Electrical or Mechanical Engineering or its equivalent. They should have had experience in the installation of high voltage switchgear and the erection of transformers and the laying and jointing of cables. Experience in the interpretation of specifications, the scrutiny of drawings, and dealing with correspondence will be an advantage.

Applicants for appointment (*b*) should have served an apprenticeship and should possess the Higher National Certificate in Electrical Engineering or its equivalent. They should have had considerable experience in the maintenance and operation of high voltage switchgear transformers, cables and overhead lines up to 132 kV.

Corporate membership or Graduate membership of the Institution of Electrical Engineers is desirable.

The salaries and conditions of service will be in accordance with the N.J.B. Agreement and the appointments will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Forms of application may be obtained from the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to whom completed forms should be sent to arrive not later than March 10, 1951. Envelopes should be endorsed with the appointment sought.

W. N. C. CLINCH,
Controller.

Northmet House,
Southgate, N.14. (H 749)

BRITISH ELECTRICITY AUTHORITY

North Eastern Division

APPOINTMENT OF DEPUTY POWER STATION SUPERINTENDENT, DUNSTON 'A,' DUNSTON 'B' AND BLAYDON POWER STATIONS

APPLICATIONS are invited for the appointment of Deputy Power Station Superintendent to cover the above-mentioned Power Stations.

Applicants should have received a thorough technical and practical training followed by wide experience in the operation and maintenance of generating plant.

Applicants should have also held a position of responsibility involving the control of technical, operating and administrative staffs.

The salary for this appointment will be in accordance with the National Joint Board Schedule "A," Grade 3, Class "K" (£1,092 to £1,142 per annum).

Superannuation will be in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age and giving full particulars of education, qualifications and experience, should be made in writing to the Divisional Secretary (Establishments), British Electricity Authority, North Eastern Division, Carliol House, Newcastle-upon-Tyne 1, to arrive not later than March 7, 1951. (H 733)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for two vacancies for THIRD ASSISTANT TRANSMISSION ENGINEERS.

Applicants for one position should be Corporate Members of the Institution of Electrical Engineers or equivalent qualifications and should have sound knowledge of the design and erection of high voltage transmission plant, together with experience of site testing and commissioning of substation plant and associated protective equipment. Applicants for the other position should be Corporate Members of the Institution of Electrical Engineers or equivalent qualifications and should have experience in laying, jointing and testing of underground cables up to 132 kV and have experience in the design and manufacture of cables and cable systems.

In both cases the commencing basic salary will be within the range £579 to £710 per annum, plus 5% London Allowance, in accordance with revised N.J.B. Schedule, Class "AX," Grade 5, subject to an ultimate maximum of £799 per annum, plus London Allowance, in Class "EX."

The appointments will be superannuable.

Applications, stating age, qualifications and experience, should be sent to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, not later than 14 days after the appearance of this advertisement. (H 635)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of THIRD ASSISTANT ENGINEER (Mains Construction) in the Central Sub-Area of the Board, based on Newtown, Llantwit, near Pontypridd.

The successful applicant will be required to assist in the work of the Sub-Area Construction and Maintenance Department. This department is responsible for the construction and maintenance of all 66 kV mains and most of the 33 kV mains in the Sub-Area. And also assist the District Engineers when requested with 11 kV and L.V. mains work. Applicants should have good experience of the construction of overhead lines of all voltages up to 66 kV.

Preference will be given to applicants who possess an engineering degree of a British University, the Higher National Certificate or its equivalent, or have passed the Graduateship Examination of the Institution of Electrical Engineers.

The salary for the position will be in accordance with Class "K"' Grade 10 (£646/£660/£674), of the National Joint Board Schedule for the Electricity Supply Industry.

Applications, stating age, present position, present salary, qualifications and experience, and whether married or single, together with the names and addresses of three referees, should be addressed to the Secretary (Establishments), The South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him not later than March 3, 1951.

D. G. DODDS,
Secretary.
(H 727

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPOINTMENT OF DISTRICT COMMERCIAL OFFICER (ABERYSTWYTH)

APPLICATIONS are invited for the above appointment in the Aberystwyth District of the Board at a salary in accordance with Grade 3 Classification "C" (£710 to £724 p.a.) of the National Joint Board Agreement.

Applicants should have a sound electrical training and experience in the commercial organisation of the electricity supply industry and be able to drive a car. Corporate Membership of the I.E.E. or equivalent qualification would be desirable and ability to speak Welsh would be an added qualification.

The duties of the post will include responsibility for the commercial administration, service centre control, and consumers' contracting and service arrangements in the Aberystwyth district, which is predominantly rural.

The appointment will be superannuable and subject to medical examination.

Application forms, obtainable from the Manager, No. 4 Sub-Area of the Board, Electricity House, Rhostyllen, Nr. Wrexham, should be completed and returned to him so as to be received not later than March 6, 1951.

JAMES RANKIN,
Secretary.
(H 724)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the following appointments at salaries in accordance with the revised National Joint Board Schedule:

1. SECOND ASSISTANT ENGINEER (Combustion) at Divisional Headquarters, AX/CX 2 (£752 to £938 p.a.).
2. SECOND ASSISTANT ENGINEER (Steam) at Divisional Headquarters, AX/CX 2 (£752 to £938 p.a.).
3. SENIOR ASSISTANT ENGINEER (Operations) at Divisional Headquarters, AX/CX 1 (£884 to £1,076 p.a.).
4. COMBUSTION AND EFFICIENCY ENGINEER at Tir John Power Station, Class "G," Grade 7 (£651 to £679 p.a.).

Applicants for posts 1 to 3 should preferably be members of the Institutions of Mechanical or Electrical Engineers, and for 4 have obtained the Higher National Certificate or its equivalent.

The following experience would be an added advantage in the posts mentioned:

1. Extensive experience in the operation and efficiency control of high pressure steam plant.
2. Considerable experience of plant erection and operation.
3. Extensive experience in generation and system operation, embodying liaison with grid control and area board.
4. Previous experience with large pulverised fuel boilers and Bailey automatic combustion control.

The appointments will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary's Office at the address below to whom completed applications should be returned not later than March 5, 1951 in a sealed envelope endorsed with the appointment sought.

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport,
Cardiff.
February 12, 1951. (H 699)

EASTERN ELECTRICITY BOARD

SALESMEN—COMMERCIAL REFRIGERATION

VACANCIES occur for SALESMEN to specialise in commercial refrigeration equipment, operating from sub-area headquarters at (1) Cambridge, (2) Norwich, and (3) Stowmarket.

Applicants must be fully experienced in handling enquiries for all types of equipment, including food storage and milk cooling, must be capable of initiating business and must have a proved sales record.

Salaries for these appointments will be in accordance with Grade 3 of the National Joint Council Salary Agreement, dated March 23, 1950 (£450 by £20 to £510 per annum).

Both future salaries and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may have to undergo a medical examination.

Applications, with fullest particulars of training, experience and sales record, should, according to the locality in which employment is preferred, be addressed to the Manager,

(1) Fens Sub-Area, Milton Hall, Cambridge,
(2) Norfolk Sub-Area, Duke Street, Norwich,
(3) Suffolk Sub-Area, Finborough Hall, Stowmarket,

so as to arrive within 14 days of the appearance of this advertisement. (H 718)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment:—

ASSISTANT SHIFT CHARGE ENGINEER—LITTLE BARFORD GENERATING STATION

Salary in accordance with the revised N.J.B. Schedule, Grade 9, Class "G" (£571 to £597 per annum).

Applicants should have served an apprenticeship and obtained an ordinary National Certificate in Electrical and/or Mechanical Engineering or equivalent, and possess experience in the operation of generating stations.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards superannuation scheme.

Applications, stating age, experience and present position, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than March 10, 1951. Envelopes should be endorsed "Assistant Shift Charge Engineer—Little Barford."

W. N. C. CLINCH,
Controller.

Northmet House,
Southgate, N.14. (H 734)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the position of TEST ENGINEER (Steam) at Divisional Headquarters, Portsmouth.

Candidates should possess a thorough knowledge of thermo-dynamics and be experienced in the determination of efficiency and losses occurring in large turbines and condensing plant. A sound knowledge of boiler testing is also required and applicants should be well acquainted with all instruments employed in the above work. Plant operating experience will be an advantage.

Applicants should preferably be corporate members of one of the appropriate senior professional institutions.

The salary will be in accordance with Grade 2 of the National Joint Board Schedule "C," at present £752 to £911 per annum.

The post is superannuable and may be subject to a satisfactory medical examination.

Forms of application may be obtained from the undersigned and must be returned not later than March 9, 1951.

P. D. A. OLIVER,
Divisional Secretary.

British Electricity House,
High Street, Portsmouth. (H 739)

SOUTH EASTERN ELECTRICITY BOARD

Dorking District

METER REPAIRER (MECHANICIAN)

WAGES 3/0½ per hour for 44-hour 5-day week under the N.J.I.C. Agreement for manual workers in the electricity supply industry. Duties include reading and inspection of meters and carrying out minor repairs and adjustments to prepayment meters and time switches.

Applications, stating age and experience, and giving two referees, must reach S. Gill, A.I.E.E., Dorking Manager, South Eastern Electricity Board, 56 South Street, Dorking by March 5, 1951.

A. L. BURNELL,
Secretary.

February, 1951. (H 735)

BRITISH ELECTRICITY AUTHORITY

North-Western Division

APPLICATIONS are invited for the following posts all of which are superannuable.

NO. 288 SHIFT CHARGE ENGINEERS—WESTWOOD, WIGAN

The salary is £651/£679 per annum in accordance with Grade 7, Class "G" of the revised National Joint Board Agreement. Candidates should possess technical qualifications, and experience in a modern generating station will be an advantage. Persons who have already applied in response to the previous advertisement need not apply again, as their applications are still under consideration.

NO. 368 STATION CHEMIST—WESTWOOD, WIGAN

The salary is provisional pending negotiations and is £651/£679 per annum in accordance with Grade 7, Class "G" of the revised N.J.B. Agreement. Applicants should preferably hold a Degree of a British University or be an Associate of the Royal Institute of Chemistry. Consideration will be given to those with the Higher National Certificate, and who are studying for the A.R.I.C. or equivalent examination. Experience in the chemical testing of coal, water and oil in connection with power plant is desirable.

NO. 372 MAINTENANCE ENGINEER (MECHANICAL)—WESTWOOD, WIGAN

The salary is £707/£737 per annum in accordance with Grade 6, Class "G" of the revised N.J.B. Agreement. Applicants should have sound technical qualifications and practical experience in the maintenance of H.F. Boilers and Turbines. A practical knowledge of P.F. plant would be an advantage.

NO. 373 SENIOR ASSISTANT ENGINEER (CONSTRUCTION)—TRANSMISSION, D.H.Q.

The salary is in accordance with Grade 1, Class "AX/DX," Schedule "C" of the revised N.J.B. Agreement, i.e. £884/£1,108 per annum. Applicants should have received a first-class technical education and have had considerable experience in the design, layout and erection of high voltage transmission lines together with substations and their equipment. Ability to deal with contract correspondence is desirable.

Applications, quoting the vacancy number, stating age, qualifications, present position, and giving full details of education and experience should be received by The Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than March 5, 1951. (H 710)

EASTERN ELECTRICITY BOARD

Suffolk Sub-Area

APPOINTMENT OF
ASSISTANT COMMERCIAL ENGINEER

APPLICATIONS are invited for the appointment of an Assistant Commercial Engineer on the staff of the Commercial Officer at the Suffolk Sub-Area Headquarters, Finborough Hall, Stowmarket. Candidates should preferably be Corporate members of the Institution of Electrical Engineers and should have had a sound engineering training and a wide experience of industrial installations and of the application and utilisation of electricity for commercial and industrial purposes. The successful candidate will be required to negotiate tariffs and conditions for supplies of electricity for industrial purposes, to give specialist advice on utilisation and to assist in the co-ordination of development of power sales generally.

The provisional annual salary for the appointment will be £675. Both the future salary and conditions of service will be subject to agreements made from time to time with the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, stating age, education, qualifications and present employment, and full details of experience, should be addressed to the Manager, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, so as to reach him within 14 days of the appearance of this advertisement. (H 719)

NORTH WESTERN ELECTRICITY BOARD

No. 7 Sub-Area

APPOINTMENT OF SUB-AREA SECRETARY

DUE to the impending retirement of Mr. A. G. Woods, the present holder of the office, the Board invite applications for the appointment of Sub-Area Secretary of the No. 7 Sub-Area at Hazel Grove, near Stockport, at a provisional salary of £1,100 per annum, subject to negotiation with the appropriate body.

Candidates should have had wide administrative and secretarial experience in a senior appointment, preferably in the electricity supply industry.

Applications, on forms to be obtained from the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, should be received by him duly completed not later than Saturday March 10, 1951. (H 712)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the following positions in the Drawing Office of the Chief Generation Engineer (Construction) at Wolverhampton:—

(a) MECHANICAL DRAUGHTSMAN

Candidates should have a wide experience in (a) the layout and design of generating stations or (b) generating plant including boilers, turbo-alternators and ancillary equipment.

The provisional salary will be in the range of £500 to £600 per annum.

(b) ELECTRICAL DRAUGHTSMAN

Candidates should have a knowledge of the layout of generating stations, works switchgear and works systems.

The provisional salary will be in the range of £375 to £475 per annum.

(c) CIVIL ENGINEERING DRAUGHTSMEN

(i) Candidates should have experience in the design of civil engineering and building works for generating stations, and reinforced concrete work.

The provisional salary will be in the range of £375 to £475 per annum.

(ii) Candidates should have had a wide experience in the layout and design of heavy structural steelwork for generating stations.

The provisional salary will be in the range of £500 to £600 per annum.

(d) ARCHITECTURAL AND BUILDING DRAUGHTSMEN

Candidates should possess wide experience in the preparation of working drawings relating to power stations and other buildings.

The provisional salary will be in the range of £500 to £600 per annum.

The salary ranges quoted are provisional and subject to negotiation with the appropriate organisation. The possession of an engineering degree or recognised qualification will be considered an advantage. Conditions of service and superannuation will be as approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and should be returned not later than March 10, 1951.

F. W. LAWTON,
Divisional Controller.
(H 732)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following appointments:

(a) ELECTRICAL MAINTENANCE ENGINEER, Grove Road Generating Station.

(b) ELECTRICAL MAINTENANCE ENGINEER, Deptford East Generating Station.

Candidates should have had a good all-round electrical engineering experience associated with the maintenance and repair of e.h.t. switchgear, transformers, switchboards, motor control gear, etc., and in cabling and wiring work. Experience in the preparation of programmes of work, in planning and in the control of men is essential.

Candidates should also have received a sound technical training, preferably of Higher National Certificate standard.

Salary for (a) will be in accordance with the revised N.J.B. Schedule, Class "F," Grade 7, i.e. £656 5s. p.a., inclusive of London Allowance.

Salary for (b) will be in accordance with the revised N.J.B. Schedule, Class "H," Grade 7, i.e. £726 12s. p.a., inclusive of London Allowance.

(c) ASSISTANT ELECTRICAL MAINTENANCE ENGINEER, Deptford East Generating Station.

Candidates will be required to assist the Electrical Maintenance Engineer in the carrying out of maintenance, repair and testing of e.h.t. switchgear, transformers, switchboards, motor control gear, etc.

Previous experience of power station work is desirable and candidates should have received a sound technical training.

Salary in accordance with the revised N.J.B. Schedule, Class "H," Grade 9, i.e. £639 9s. p.a., inclusive of London Allowance.

All the foregoing appointments are superannuable under the terms of the B.E.A. and Area Boards' Superannuation Scheme.

Applications, stating age, qualifications and experience, should be addressed to Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within 14 days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(H 698)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following positions in the Cornwall Sub-Area:—

Central Cornwall District, Headquarters at Truro

(a) THIRD ASSISTANT DISTRICT ENGINEER

Provisional commencing salary £494 per annum (Class "D," Grade 9, N.J.B. Schedule).

The duties attached to this post will include the maintenance of overhead and underground mains up to 33 kV and the construction of l.v. and h.t. lines and sub-stations up to 11 kV.

Candidates should have knowledge and experience of the operation, maintenance and construction of overhead and underground mains, including ancillary equipment. Experience of overhead transmission is essential.

(b) FIRST ASSISTANT DISTRICT ENGINEER

Commencing salary £641 per annum (Class "D," Grade 5, N.J.B. Schedule).

The successful candidate will be required to undertake the preparation of system improvement schemes, capital sanction applications for new works, forward planning, maintenance of protective gear, fault location and supply of technical data. He will also be required to deputise for the District Engineer, in his absence, and generally assist him in all engineering matters.

Candidates should have had a wide experience and knowledge of an overhead distribution system.

North Cornwall District, Headquarters at Bodmin

(a) DISTRICT ENGINEER

Commencing salary £732 per annum (Class "D," Grade 3, N.J.B. Schedule).

The successful candidate will be responsible to the District Manager for the construction, operation and maintenance of the distribution system, including protective gear, and for the preparation of schemes and estimates (all voltages).

Candidates should possess extensive knowledge of and have had wide experience on the engineering side of the industry, and be capable of promoting progressive engineering development policy.

Corporate membership of the Institution of Electrical Engineers will be an advantage.

(b) FIRST ASSISTANT DISTRICT ENGINEER

Commencing salary £641 per annum (Class "D," Grade 5, N.J.B. Schedule).

The successful candidate will be responsible for duties of a similar nature to those outlined in 1 (b) above.

South Cornwall District, Headquarters at St. Austell

FIRST ASSISTANT DISTRICT ENGINEER

Commencing salary £641 per annum (Class "D," Grade 5, N.J.B. Schedule).

The successful candidate will be responsible for duties of a similar nature to those outlined in 1 (b) above.

Successful candidates will be liable to transfer within the Area. Applications, giving age, present appointment and salary, also details of qualifications and experience, should be submitted to reach the Sub-Area Manager, South Western Electricity Board, Pool, Redruth, Cornwall, by March 5, 1951. (H 711)

ASSISTANT ENGINEER for London office with experience of design, detailing and scheduling of overhead transmission lines and underground cables.—Write, Box No. 275, c/o Walter Judd Ltd., 47 Gresham St., E.C.2. (H 743)

ASSISTANTS required for Test Bed of Electrical Engineering firm in North West Kent. Applicants should have knowledge of a.c./d.c. motors and allied apparatus. State age, experience, and wage required.—Box No. 3089, Electrical Times. (H 688)

REPRESENTATIVE

WOOLLEYS OF TAMWORTH invite applications for the position of Representative (covering Service and Sales) in each of the following Electricity Board areas: (1) East Midlands, (2) Yorkshire, (3) North Eastern.

ESSENTIALS.—(a) Age 25-40; (b) knowledge of Woolley equipment; (c) knowledge of at least one make of milking machine; (d) enthusiasm to give service whenever necessary; (e) proved ability to sell farm equipment; (f) tactful, pleasing manner.

DESIRABLES.—(a) Knowledge of Electric Supply Authorities in the Area; (b) knowledge of Agricultural Engineering Firms in the area; (c) organising ability; (d) ability to produce a motor-car.

IN ADDITION.—Please include details of education, War Service, positions held since leaving school, reference to any pension rights in present position, whether married, and salary required. All replies, which will be treated in strict confidence, should be addressed to **J. W. Woolley, Esq., Ashby Road, Tamworth, Staffs.** and marked (1), (2) or (3) respectively in the top left-hand corner of the envelope. Testimonials are not required in the first instance. Closing date for applications is February 28, 1951.

(H 619p)

SWITCHGEAR

JOHNSON AND PHILLIPS LIMITED require TWO SENIOR DRAUGHTSMEN. Applicants must be suitably qualified and competent to handle switchgear for indoor and outdoor main stations and substations up to 33,000 V or to design switchgear apparatus embracing air-break and oil-break circuit-breakers. Both positions offer good scope to the right man with prospects of early promotion. Applications in writing, stating age, experience and salary required, to: **Employment and Welfare Manager, JOHNSON & PHILLIPS LTD., CHARLTON LONDON S.E.7** (H 618p)

A SHOP MANAGER required for electrical showroom, Lowestoft. Leading agencies held. Electrical retail and display experience essential. Fine opportunity for keen, sales-minded, hardworking young man seeking permanent post with outstanding prospects. Experience, age, commencing salary.—Box No. 3097, Electrical Times. (H 707)

AFRICAN CABLES LIMITED, TRANSVAAL, require services of LABORATORY ASSISTANT. Some previous experience of electric cable manufacture an advantage. Single man preferred. Salary £600 per annum plus cost of living allowance at present £80/15/- single, £172/10/- married. Passage paid to South Africa.—Full particulars, training and experience, to Box No. 4005, Electrical Times. (H 748)

APPLICATIONS are invited for a number of vacancies for ELECTRICAL ENGINEERING SENIOR DRAUGHTSMEN for the installation of electrical equipment in large civil and military aircraft. Some knowledge of electronic equipment is desirable and possession of O.N.C. or H.N.C. (Elect.) preferable. The vacancies are for Cricklewood and Radlett (Herts) drawing offices. Further vacancies exist at Cricklewood only for Junior Electrical Engineering Draughtsmen for detailing the above work. The positions offer excellent opportunities for advancement to keen men. Write, stating age and full details of experience and qualifications, to: Staff Officer, Handley Page Ltd., Cricklewood, London N.W.2. (H 686)

CONSULTING Engineers in London specialising iron and steel, non-ferrous metals, require qualified ASSISTANT ELECTRICAL AND INSTRUMENTATION ENGINEER to supervise site installations and starting up Bristol and South Wales area.—Write, stating age, training, experience, to Box No. 3091, Electrical Times. (H 689)

COSTING CLERK, West End Contractor's Office (E.C.A.). Used to costing and general office routine, wages, P.A.Y.E.—Write previous experience and salary required, Box No. 3007, Electrical Times. (H 752)

DRAUGHTSMAN required by manufacturers of industrial electric cooking and heating equipment. Midlands. Age, experience and salary required.—Box No. 4003, Electrical Times. (H 747)

ELECTRICAL DRAUGHTSMEN. Imperial Chemical Industries Ltd., Salt Division, has a vacancy for an Electrical Draughtsman at Winsford, Cheshire. Applicants should possess the Higher National Certificate or equivalent and have had considerable experience in the layout of power and lighting installations, distribution and control diagrams, etc.—Application forms can be obtained from the Staff Manager, Imperial Chemical Industries Ltd., Salt Division, Winsford, Cheshire. (H 700)

ELECTRICAL DRAUGHTSMEN wanted for long-term oil refinery and chemical plant programme. Five-day week, pension and insurance plan.—Write, stating experience and salary required, to: Chief Engineer, E. B. Badger and Sons (G.B.) Ltd., 40 Parkgate Road, Battersea, London S.W.11. (H 745)

ELECTRICIAN required for London firm with factories in Homerton and Essex. Apprenticeship and knowledge to standard of higher national certificate and some factory experience essential. Knowledge of instruments, layouts, Diesel generators and flameproof installations desirable. This is a position which can develop with the competence of the holder.—Please reply, giving details of experience and salary required, to Box No. 3093, Electrical Times. (H 701)

ENGLISH ELECTRIC, Stafford, require TRANSFORMER DESIGN ENGINEERS for high power systems. Good engineering qualifications desirable and practical experience on transformer design problems essential.—Write, giving full details and quoting Ref. 225E, to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (H 692)

ENGLISH ELECTRIC require experienced DESIGN ENGINEERS for interesting heavy electrical switchgear projects. Professional engineers with sound electrical or mechanical design experience should write, giving full details, stating preference for Stafford, Liverpool, or London areas, and quoting Ref. 249B, to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (H 681)

EXPERIENCED DRAUGHTSMAN required for electro mechanical instrument and remote indication project development. Excellent opportunity for a suitable man.—Write, stating full particulars and salary required, to Technical Manager, Measurement Limited, Remote Control Division, 7-17 Fitzalan Street, S.E.11. (H 754)

FERRANTI LIMITED invite applications for SENIOR APPOINTMENTS of graduate engineers with industrial experience in the design of electricity meters. The posts to be filled carry senior responsibility with excellent prospects, generous salary and pension.—Application forms from the Staff Manager, Ferranti Limited, Hollinwood. Please quote Reference M.E. (H 603)

FIRST-CLASS PLANNING AND METHODS ENGINEER required to apply most modern assembly methods to manufacture of small electro-mechanical products. West London area.—Write, giving age, experience, recent references and salary required, to Box No. 3071, Electrical Times. (H 636)

ILLUMINATING ENGINEER, experienced in modern lighting practice required in London I.E. Department for the planning, estimating and supervision of street lighting projects.—Applications, stating experience, qualifications and age, to Staff Manager, Siemens Electric Lamps and Supplies Limited, 38-39 Upper Thames St., E.C.4. (H 744)

METER TESTER required, able to take charge of repairs and testing all types of meters.—Apply in writing, giving age, experience and wages: Electric Meter Co., Castor Road, Brixham. (H 552)

OIL Refinery Contractors require a qualified ENGINEER to be responsible for specifying and selecting all types of pumps, motors, turbines, compressors, etc., used in the refining industry. Applicants should have had past experience of such equipment, particularly application of process type centrifugal pumps in the petroleum industry.—Write fully, Foster Wheeler Ltd., 3 Ixworth Place, London S.W.3. (H 399)

POWER PLANT CHARGE ENGINEER required by major oil company for employment in the Middle East to operate a combined gas and steam turbine station where he will take charge of a shift. Applicants who should be under 30 years of age, must possess a Higher National Certificate in electrical engineering and have served an apprenticeship in the generation division of a power supply organisation undertaking power station control room operation, followed by experience as a boiler house or turbine room charge engineer. Attractive salary plus generous allowance in local currency designed to assist substantially in meeting cost of living, free passages kit allowance, free medical attention, good leave arrangements, pension scheme.—Write, stating personal particulars and details of qualifications and experience, quoting Dept. F.13.F, to Box 3336 at 191 Gresham House, E.C.2. (H 415)

QUALIFIED ELECTRICAL ENGINEER, commercial experience essential, required for responsible permanent position Pakistan. Salary approximately £1,200 p.a. and appropriate expenses. Single man aged 30 to 35 preferred. Applicants must have sound knowledge theory and practice of power, transmission and distribution. Knowledge of line communication system an advantage. The post offers good prospects with old established company.—Apply Box No. 2081, Electrical Times. (H 368)

SALES MANAGER required by well-known company manufacturing electrical resistance alloys. The post calls for a man experienced in the electrical trade and capable of negotiating at high level by personal contact.—Please submit full details, in confidence, to Box No. 3095, Electrical Times. (H 706)

THE GENERAL ELECTRIC COMPANY, LTD., invites applications for the position of MANAGER of the Electrical Department of their agency in Venezuela. Applicants may be between 28-45 years of age. A good background of technical knowledge is required, coupled with sales experience of consumer electrical apparatus such as domestic appliances, lighting fittings, radio, etc. A knowledge of Spanish is desirable. This appointment carries an attractive starting salary and there are excellent opportunities for advancement.—Apply, in writing, Staff Manager, G.E.C., Magnet House, Kingsway, W.C.2. (H 740)

TEST ENGINEERS required for fluorescent control gear department in the London area. Applicants should have some practical experience in electrical engineering and technical education up to the national certificate standard. Previous experience in the installation and working of fluorescent lighting equipment, would be an advantage. Good prospects exist for suitable man with good technical knowledge for a position which is superannuated.—Apply: S.A.M., Ekco-Ensign Electric Ltd., 5 Vigo Street, W.1. (H 702)

CANADA

ONTARIO

Large electrical company requires EXPERIENCED CIVIL, ELECTRICAL and MECHANICAL ENGINEERS, DRAUGHTSMEN and TECHNICIANS. Excellent opportunities. Call, or write, stating experience:

Dept. B., Ontario Immigration, Ontario House, Charles II St., London S.W.1. (H 418p)

THE opportunity exists for the employment of a QUALIFIED ENGINEER in the management of a successful old-established company manufacturing electrical switchgear. He should have scientific and commercial qualifications as well as practical experience. Good salary and prospects for a suitable person.—Box No. 3099, Electrical Times. (H 715)

APPOINTMENTS WANTED

TWO FULLY QUALIFIED ELECTRICIANS with experience in all types of installation work in power stations, large factories and commercial establishments, at home and abroad, require progressive positions, preferably overseas.—Box No. 3017, Electrical Times. (H 479)

YOUNG MAN of culture and initiative, with wide experience of electronics and light electrical engineering, accustomed to accepting responsibility, seeks new position wherein the more uncommon traits are desired.—Box No. 3063, Electrical Times. (H 608)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines). Service Electric Co., Ltd., Stanmore, Middx. (D 324)

ARMATURE SERVICE CO. LTD., Haddington Street, Hove (Tel. 32996), electrical engineers and winding specialists. Distance no object. (F 739)

CASTINGS, Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (H 268)

SILVER or soft soldering, light welding, capacity available for repetition work.—Write, M.B. Co., Ltd., 68a East Hill, Dartford, Kent (Phone 3165). (H 641)

WINDING and light assembly capacity available. Competitive quotes from Labgear Ltd., Cambridge. (H 742)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installation, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Phone: Chiswick 5105. (A 20)

STEEL, ALUMINIUM, BRASS and other non-ferrous sheets, strip, bars, off-cuts. Any quantity, gauge, size. Immediate payment.—Grades Sheared Metal Co., Ltd., Green Lane, Hounslow, Middlesex. Telephone: Feltham 3274. (H 650)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (A 16)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED.—Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath. (A 5)

WANTED. D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (A 13)

WANTED—SWITCHBOARDS for 9 kVA Meadows/B.T.H. 230 V alternator sets.—Offers to Box No. 3041, Electrical Times. (H 547)

BUSINESS OPPORTUNITIES

LONDON agents important Indian manufacturers electrical motors, starters, power and distribution transformers seeking technical and financial co-operation invite correspondence.—Box No. 3087, Electrical Times. (H 687)

FOR SALE

CABLES & WIRE

CABLE for sale: 6,000 yd of 28/012-3 core T.R.S. at £70 per 1,000 yd, to clear.—E.E.S. (B'ham) Ltd., 92 Cheapside, Birmingham 12. (H 741)

ENAMEL/RAYON SILK Copper and Resistance Wires. Can we help you? We may have it in stock.—Phone Greenwich 1672, Saxonia. (H 755)

NICKEL CHROME, CUPRO NICKEL, AND EUREKA WIRES for sale, 22 to 42 gauge, also approximately 2,700 lb. combed electrical Cotton Cheeses.—Hipprum Wires, Ltd., Hipperholme, Halifax. (H 691)

ENGINEERING PLANT & MATERIALS

WELDING PLANT. Several Motor Generator Arc Welders, single, double and multi operator up to 600 amps. Input 400/440 V, 3-phase, 50 c/s. Also several single and double operator transformer arc welders. All modern units by well-known makers. Attractive prices. Full details.—Write: Thos. W. Ward, Ltd., Albion Works, Sheffield (Phone 26311, ext. 347). (H 294)

WILD BARFIELD Electric Muffle FURNACE, complete with control panel and pyrometer, 230V 1·5oc. Smithy Bellows, 2 pairs Alldays, 30in. 4in. Bench Shears. —Offers to: Gordon Russell Limited, Broadway, Worcs. (H 612)

GENERATING PLANT

DIESEL ALTERNATOR SETS from stock: 400/440 V, 3-phase, 50 c/s, 167 kVA "Waukesha/G.E.C.," 1,000 r.p.m.; 150 kVA "Petter Brush," 500 r.p.m.; 135 kVA "Blackstone/Metro-Vick," 500 r.p.m.; 150 kW "General Motors/Westinghouse," 1,000 r.p.m.; 100 kVA "Deutz," 1,000 r.p.m.; 69 kVA "McLaren Brush," 1,000 r.p.m.; 65 kVA "Meadows/McFarlane," 1,500 r.p.m.; 62·5 kVA "McLaren/Bruce-Peebles," 1,000 r.p.m.; 50 kVA "National/Bruce-Peebles," 750 r.p.m.; 20 kVA "Lister/Metro-Vick," 1,000 r.p.m. Full details with price post free on request. —Thos. W. Ward, Ltd., Albion Works, Sheffield (Phone 26311, ext. 347). (H 292)

STEAM DRIVEN GENERATING SETS.

7,500-kW turbo alternator by BRITISH THOMSON-HOUSTON, of the impulse type with a 2-stage Curtis wheel and 7 impulse stages, fitted with stainless steel and bronze blading and designed for use with steam at 180/200 lb. sq. in., 550/574 deg. F temperature exhausting to a vacuum of 28 in., speed 3,000 r.p.m. and direct coupled on combined baseplate to 9,400-kVA alternator; 0·8 power factor, 6,300/6,600/3/50 with exciter. The surface condenser by W. H. Allen has cooling surface of 15,500 sq. ft. and is fitted with special brass tubes. Motor driven Circulating Pump and Condensate Pump are fitted together with 2-stage steam jet air ejection. Auxiliary electric supply is 400/440/3/50.

2,500-kW (3,125-kVA) pass-out turbo-alternator set by HOWDEN/SIEMENS for 480/3/50, speed 3,000 r.p.m. Steam pressure 195 lb sq in., temperature 510° F, passing out 50,000 lb. steam per hr at 40 lb pressure. Mirrlees surface condenser and condenser pump.

Two 600-kW (750-kVA) geared turbo-alternator sets by G. and J. WEIR E.C.C. for 400/440/3/50, 4-wire, speed 4,000/1,000 r.p.m., through David Brown reduction gear. Steam pressure 150 lb sq in., 15 lb back pressure, suitable for pressures up to 190 lb sq in. With switchboard and direct coupled exciter.—George Cohen Sons and Co., Ltd., Wood Lane, London W.12 (Tel.: Shepherds Bush 2070), and Stanningley, near Leeds (Tel.: Pudsey 2241). (H 643)

"TANGYE" GENERATOR for sale, 220 V, d.c., 130 amps with control panel. Driven by 34 b.h.p. single cylinder horizontal diesel engine. Inspection at works in W. England.—F. J. Edwards, Ltd., 359 Euston Road, London N.W.1. (H 693)

138 kVA DIESEL SETS, two available, each having Paxman engines with control panels and switchboards consisting of 500 amp and four 200 amp O.I switches. Can be synchronised. Complete with compressor starting plant. £1,700 both machines and switchboard. In excellent condition.—Boyce, Weir and Co., 778 New Hey Road, Huddersfield. Tel.: Stainland 2120. (H 609)

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PURLEY CHOKES AND BALLASTS. Our 80-w. Tappe h.p.f. Ballast, with Starter Switch-holder incorporated, is proving itself the most popular unit. Suitable for most fittings, 57/6 each, subject.—F. W. Blanshard, Ltd. (Dept. ET), Purley, Surrey. Uplands 4818/9. (E 343)

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4 KW IMMERSION HEATERS 26 in. long with Thermostat £6 10s. each. 15 amp. shutter type PLUGS and SOCKETS 5/- each. GALV. CHAIN for all purposes 4/6 doz. yd. 15 amp. industrial SWITCH SOCKET and PLUG 10/6 each. Metal clad SPLITTERS two-way 7/6 each. 8mfd. dub. ballast CONDENSERS 8/6 each. Transtar Quick Start Control Units, 40W. 37/6, 80W 52/6. 3 Light Electric Fittings with Shades, fits into existing lampholder (including Pur. Tax) 38/6. Orders over £10 carr. paid.

WINCO INDUSTRIES
17 STRETFORD RD., MANCHESTER 15. (H 750p)

IMMERSION HEATERS. Grubb 4 kW. No purchase tax. All lengths, 15 in. to 36 in. Standard voltages. Provision for intermediate loadings. Fully guaranteed and immediate delivery. Write for illustrated brochure, latest lists and trade terms to distributors.—John Owner and Co., Ltd., Springfield Road, Birmingham 13. Tel.: Spr. 2939. (C 392)

METERS

A.C. and d.c. quarterly and prepayment METERS.—Electric Meter Co., Castor Road, Brixham. (H 554)

HOUSE Service METERS from 5/-. Guaranteed 2 years. —Electric Meter Co., Castor Road, Brixham. (H 555)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (C 51)

METERS, a.c. and d.c., new and reconditioned, all types. Quarterly; single- and three-phase; 3- and 4-wire; 2½ to 1,000 amp; prepayment, single and double tariff; single, dual and triple coin; fixed and variable tariff; 2½ to 50 amp. M.D.I. Billiard Switches, Rent Collectors. Prices from 5/-, carriage paid. Two-year guarantee. Immediate delivery. Illustrated catalogue from The Electric Meter Co. Castor Road, Brixham, Devon. (H 553)

MOTORS & STARTERS

CITY OF CHICHESTER

DISPOSAL OF 250 H.P. ELECTRIC MOTOR

OFFERS are invited for the purchase of a Westinghouse 250 h.p. slip-ring induction motor, 1,460 r.p.m., 400 V, 3-phase, 50 cycles, which may be inspected at the Waterworks, Fishbourne, near Chichester.

Tenders, in plain sealed envelopes, endorsed "Tender for Electric Motor," should be delivered to the undersigned on or before March 16, 1951.

The Council do not bind themselves to accept the highest or any tender.

ERIC BANKS,
Town Clerk.

Greyfriars,
North Street, Chichester.
February, 1951. (H 704)

A.A. ELECTRICAL CO.—FOR A.C./D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Fairlands 8279, 67 Rothschild Road, W.4. (A 19)

A.C. and D.C. MOTORS GENERATORS, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. Edgware 8631/4. (A 476)

A.C. and D.C. Motors, Alternators, Generators, Generating Sets, Transformers, Welders, Plating equipment, Control Gear, Switchgear, Portable Electric Tools, etc. Write for current electrical stock list, post free.—Thos. W. Ward, Ltd., Albion Works, Sheffield (Phone 26311, ext. 347). (H 291)

BRAND NEW A.C. Motors from stock: 1/3 to 150 h.p. Slip Ring and Squirrel Cage, 400/440 V, 3-phase, 50 c/s at 750, 1,000 and 1,500 r.p.m., with or without control gear. Immediate dispatch from stock. Attractive prices. —Full details post free from Thos. W. Ward, Ltd., Albion Works, Sheffield (Phone 26311, ext. 347). (H 293)

ELECTRIC MOTORS, GENERATORS, TRANSFORMERS A.C. & D.C.
STARTERS, SLIP RING & D.C., SEMI-AUTOMATIC
Any voltage, new, short delivery, all types of revolving electrical power.
ELECTROPOWER COMPANY LIMITED
Kingsbury Works, Kingsbury Road, London N.W.9.
Telephone: COLindale 4621/2. (D 17p)

A.C. and D.C. MOTORS, GENERATORS, SWITCHGEAR, etc., always in stock. Let me have your inquiries.—G. E. Whittaker, Wellington Mill, Bolton Road, Blackburn. Tel. 7232. (A 12)

A.C. and D.C. MOTORS, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.22 (Forest Hill 2278-9). (A 10)

FOR ELECTRIC MOTORS, GENERATORS, ALTERNATORS, SWITCHGEAR, please send your inquiries to Oldfield Engineering Co., Ltd., 96 East Ordsall Lane, Salford 5. (C 296)

90 H.P. totally enclosed 720 r.p.m. slip-ring MOTOR, 400/3/50. Ball bearing. Complete with starter. As new. Bargain price.—Boyce, Weir and Co., 778 New Hey Road, Huddersfield. Tel.: Stainland 2120. (H 610)

SWITCHGEAR

MERCURY SWITCHES are made by Hall Drysdale and Co., Ltd., of 58 Commerce Road, Wood Green, London, N.22. Tel.: Bow 7221. (C 175)

TRANSFORMERS & CONVERTORS

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

ROTARY CONVERTOR EQUIPMENT FOR DISPOSAL

THE Board offers for sale the following Rotary Convertor Plant as taken out of commission:—

Two Westinghouse Rotary Convertors (1,000 r.p.m.), each of 150 kW output; each with one 175-kVA transformer; input 6,600 V, 3-phase, 50 c/s; output 550 V d.c.; each with starting panel and d.c. control panel with hand-operated circuit-breaker.

One Metropolitan Vickers Rotary Convertor (1,000 r.p.m.), 100 kW output; with one 111 kVA transformer; input 6,600 V, 3-phase, 50 c/s; output 550 V, d.c.; with starting panel and d.c. control panel with auto-reclose circuit-breaker.

This plant can be inspected at the Board's Dryden Street Substation, Bingley, by arrangement with the District Manager, Electricity Offices, Coney Lane, Keighley.

Offers for the purchase and removal of this plant should be forwarded to the undersigned as soon as possible.

T. H. CARR,
Sub-Area Manager.

45-53 Sunbridge Road,
Bradford.
February 14, 1951. (H 737)

ONE oil-filled E.C.C. TRANSFORMER, 300 kVA, 3-phase, 50 c/s, 6,300/400 V, with tap changing switch and sealing chamber on h.t., No. 42977, supplied September, 1944. Price £350 or nearest.—Elliott-Lucas Ltd., Churchbridge Works, Cannock, Staffs. (H 645)

UNCLASSIFIED

"AVERY" DYNAMIC BALANCING MACHINE, type A.O.O. Capacity 8 oz.-8 lb. Up to 5 in. diameter and 12 in. length. Suitable for a.c. single phase, 230 V, 50 cycles.

This machine is practically unused, and is in perfect condition—having been recently checked by the makers.

Apply: Sterling Engineering Co., Ltd., Sterling Works, Dagenham, Essex. (H 703)

BROOKS motorised double-ended POLISHING SPINDLE 2½ h.p. Pedestal type, push button control. As new. Spindle extension, sundry mops, etc. Offers.—W., 239 Staines Road, Hounslow. (H 751)

BUSINESSES FOR SALE

MODERN fully equipped Factory and Offices, about 15,000 sq ft. North London, suitable light engineering, sheet metal, assembly. £25,000. Solicitors and accountants only.—Box No. 4001, Electrical Times. (H 746)

MISCELLANEOUS

CITY AND GUILDS (Electrical, etc.) on "No pass—No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 176-page handbook, FREE and post free. B.I.E.T. (Dept. 39), 17 Stratford Place, London W.1. (D 244)

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THE INSTITUTION OF ELECTRICAL ENGINEERS

SCHOLARSHIPS FOR 1951

THE Council of the Institution of Electrical Engineers will this year consider the award of Three Research Scholarships and Grants, and Six Scholarships for students to attend Universities or Technical Colleges.

RESEARCH SCHOLARSHIPS—Ferranti Scholarship, value £250 per annum for two years; Swan Memorial Scholarship, value £120 for one year; C. P. Sparks War Thanksgiving Fund, a grant not exceeding £100 for one year.

STUDENT SCHOLARSHIPS—Duddell Scholarship, value £150 per annum for three years; Silvanus Thomson Scholarship, value £100 per annum plus tuition fees for two years; Salomons and David Hughes Scholarships, value £60 for one year; Paul Scholarship, value £50 per annum for two years; Thorrowgood Scholarship, value £25 for one year but may be extended.

The closing date for receiving applications is April 16, 1951 for Student Scholarships, and June 1, 1951 for Research Scholarships.

Full particulars of these scholarships and nomination forms may be obtained from the Secretary, The Institution of Electrical Engineers, Savoy Place, London W.C.2. (H 695)

RICHARDS AND PARTNERS, associated with George Offord and Co., Auctioneers and Valuers of PLANT AND MACHINERY AND INDUSTRIAL PROPERTY, Granville House, Arundel Street, London W.C.2. Tel.: TEMple Bar 7471. (A 23)

THE proprietor of British Patent No. 499274, entitled "CARBON ELECTRODES FOR ELECTRIC ARC LAMPS," offers same for license or otherwise to ensure practical working in Great Britain.—Inquiries to Singer, Stern and Carlberg, 14E Jackson Boulevard, Chicago 4, Illinois, U.S.A. (H 626)

E.A.W. CERTIFICATE FOR DEMONSTRATORS AND SALESWOMEN

THE E.A.W. EXAMINATION IN ELECTRICAL HOUSECRAFT (Theoretical) will be held on Thursday, June 14, 1951, from 3 p.m. to 6 p.m. at various centres in Great Britain.

Full particulars may be obtained from: Examinations Department, The Electrical Association for Women, 35 Grosvenor Place, London S.W.1.

IMPORTANT.—The final date of entry for the Examination is May 3, 1951. (H 753)

THE proprietor of British Patent Nos. 594409 and 594452, entitled "CONDENSER WINDING MACHINE" and "IMPROVED SUPPORT FOR A ROLL OF STRIP FED TO A CONDENSER WINDING OR OTHER MACHINE" respectively, offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 14E Jackson Blvd., Chicago 4, Illinois, U.S.A. (H 694)

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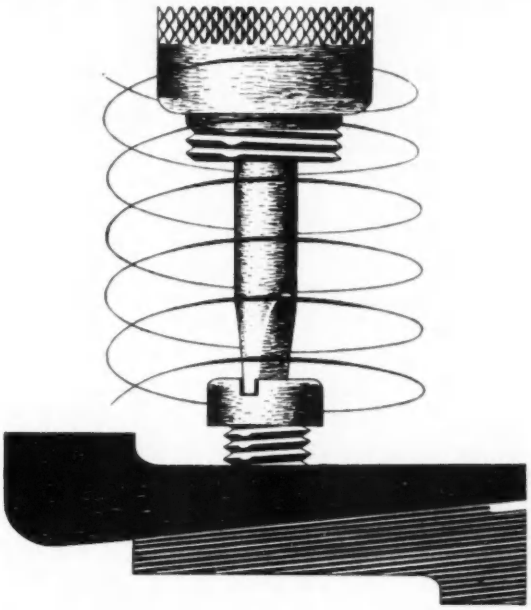

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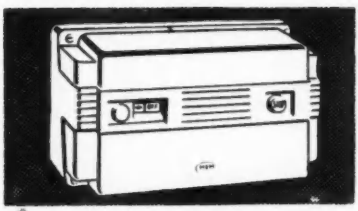

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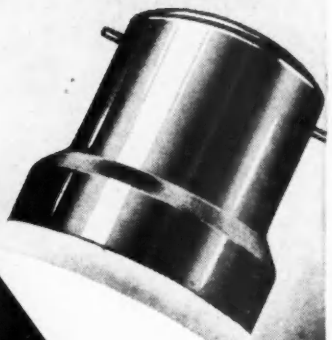

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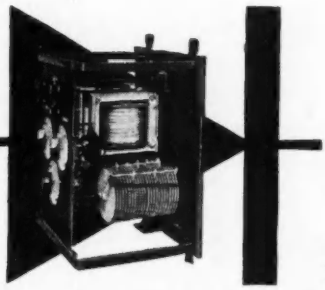

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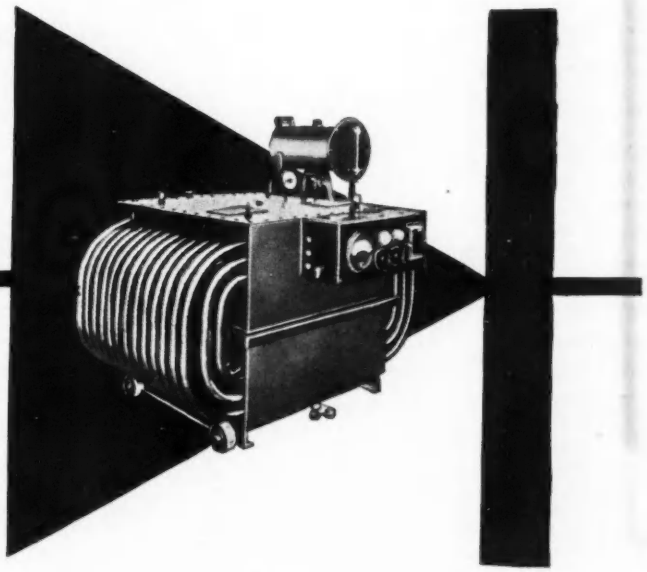

Top illustration: Battery Charger (Cover removed)
Lower illustration: E.H.T. Rectifier Equipment (Oil immersed)

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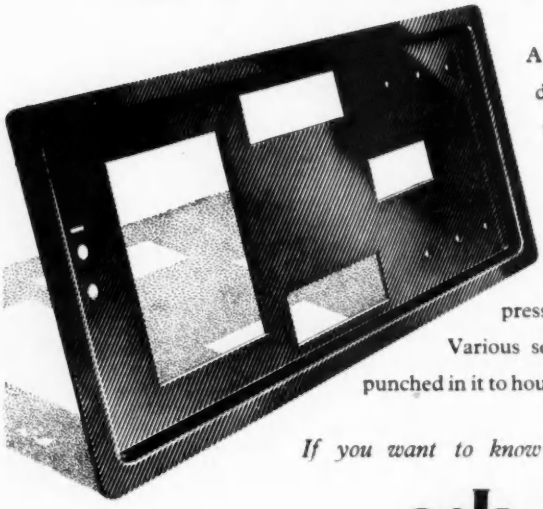

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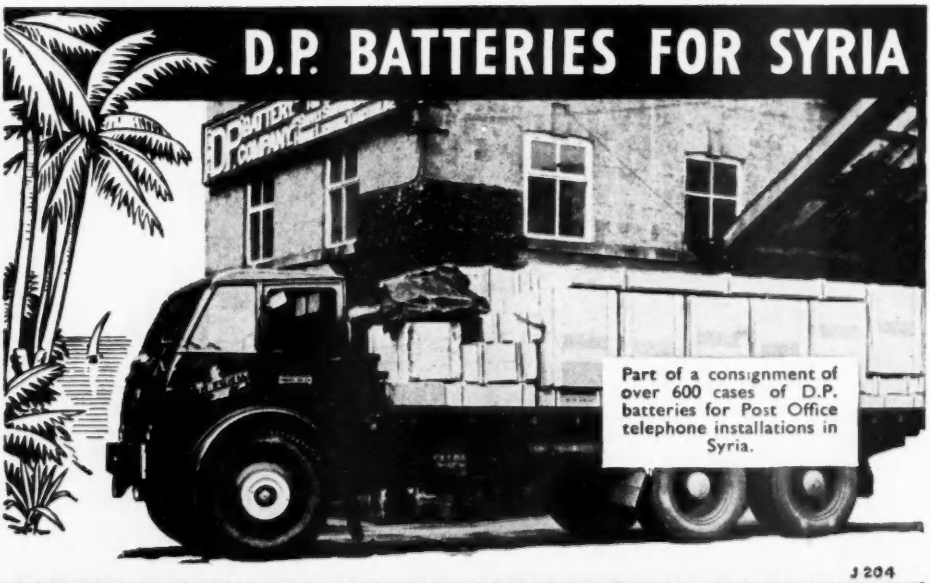

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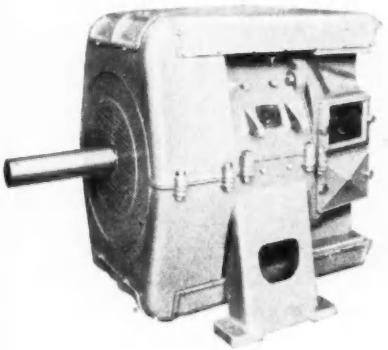

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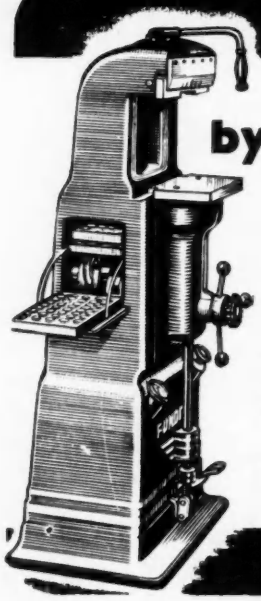

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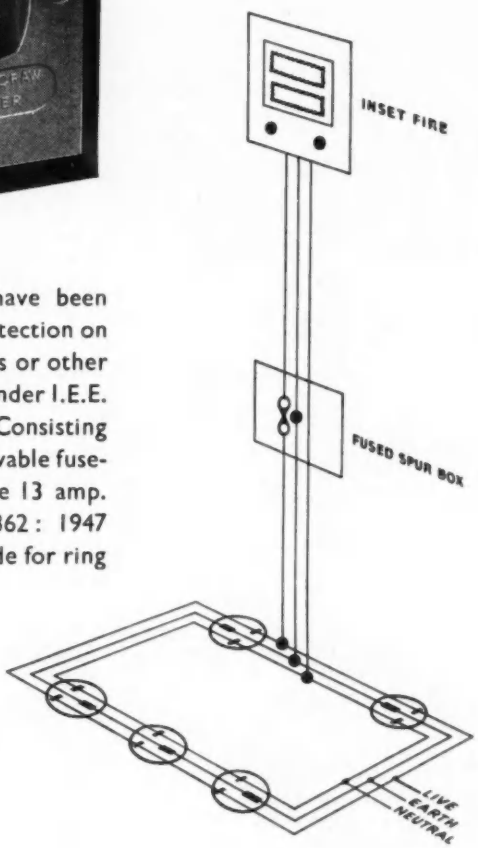

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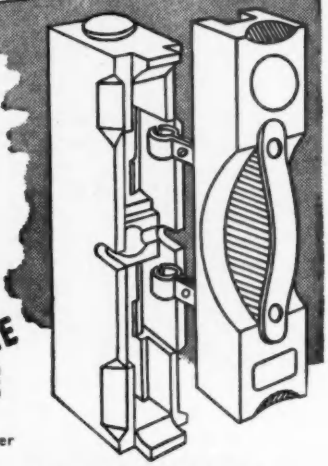

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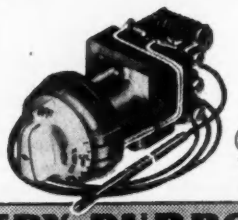

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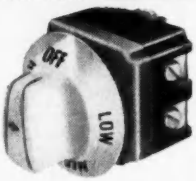

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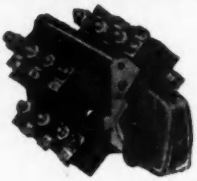

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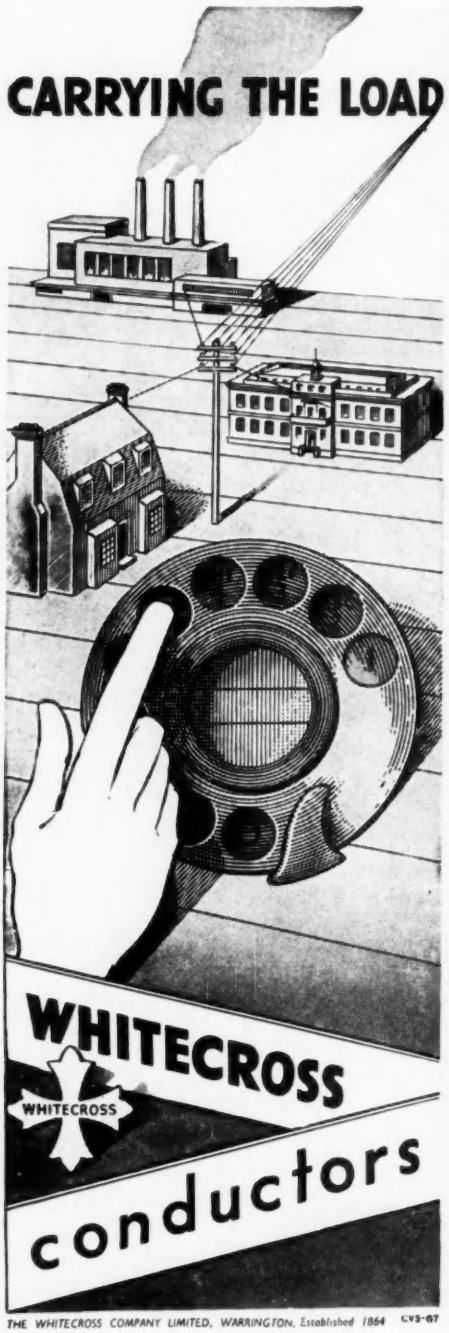

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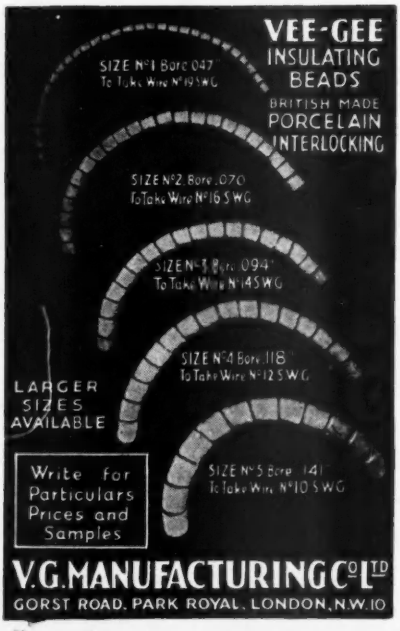
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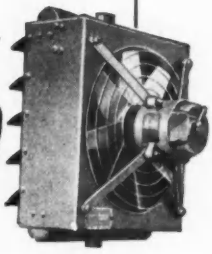

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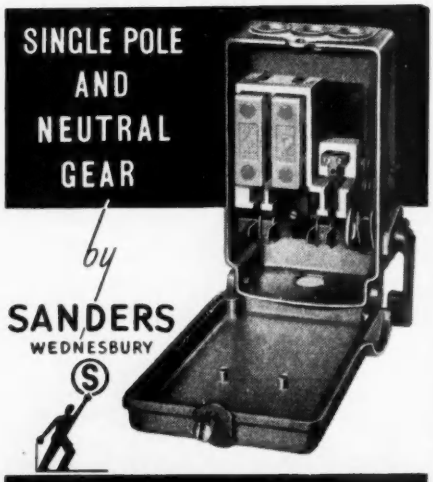

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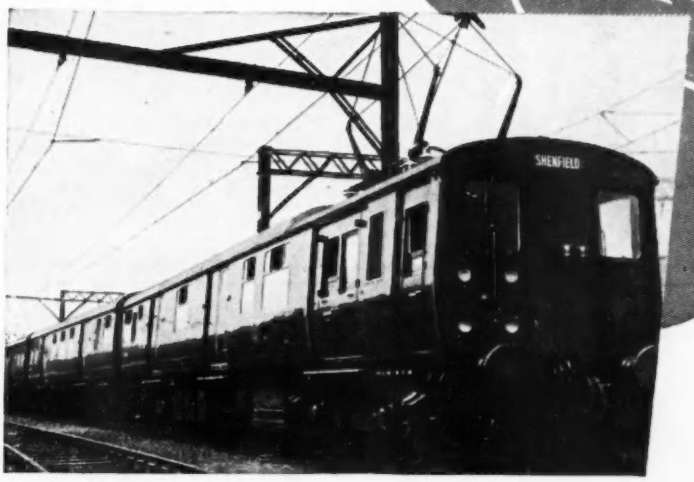

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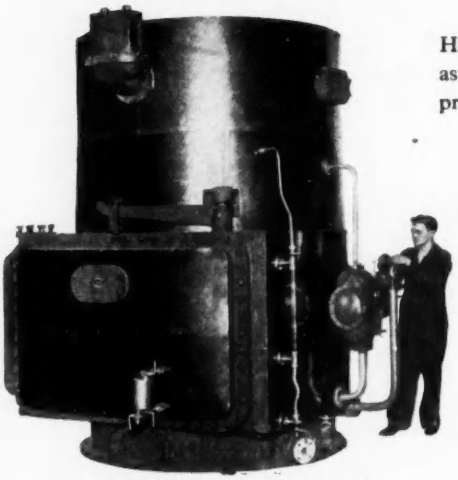

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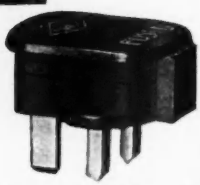

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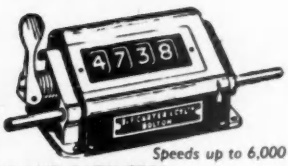

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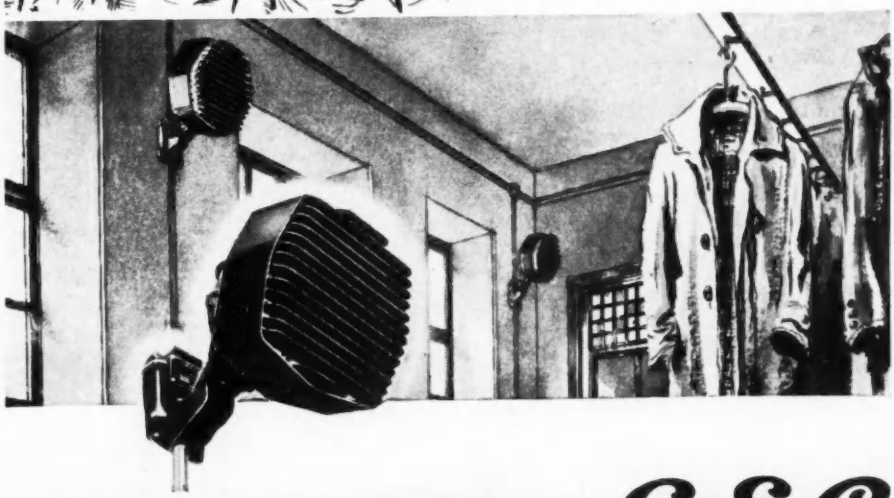

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IGRANIC
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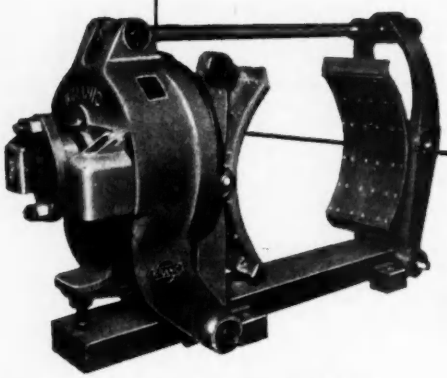

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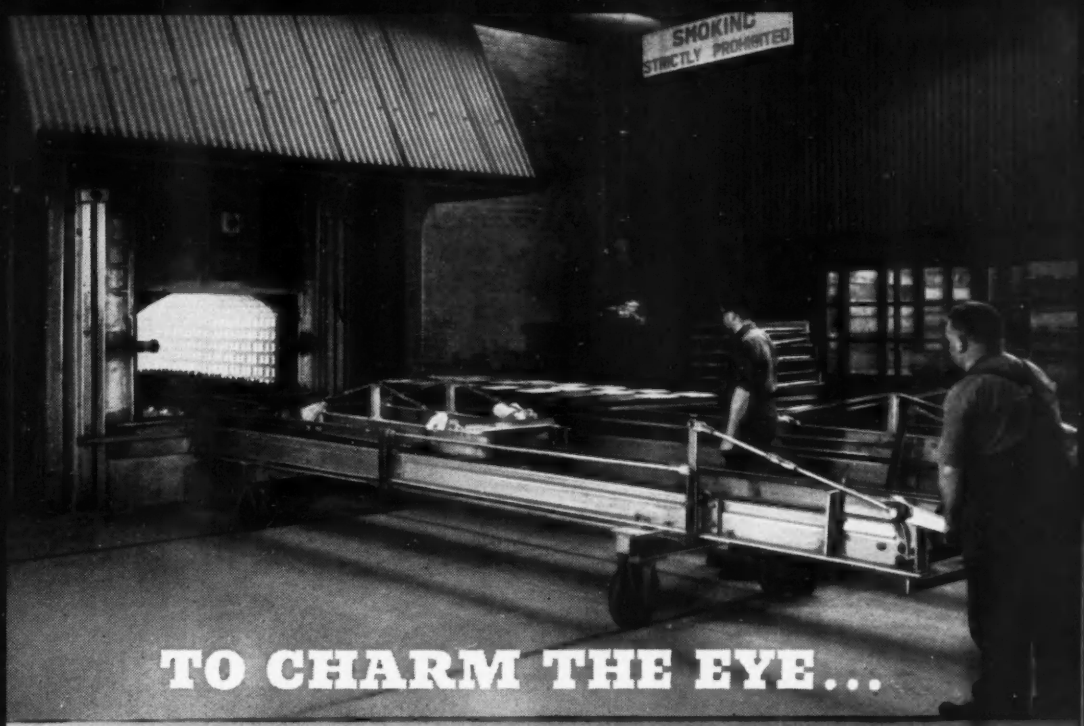
Printed in England for the Proprietors, THE ELECTRICAL TIMES, LTD., by SUN PRINTERS, LTD., London and Watford, Herts., and published at Sardinia House, Sardinia Street, London, W.C.2. February 22, 1951.



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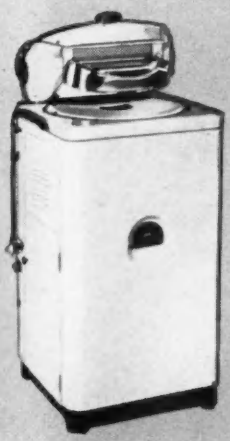

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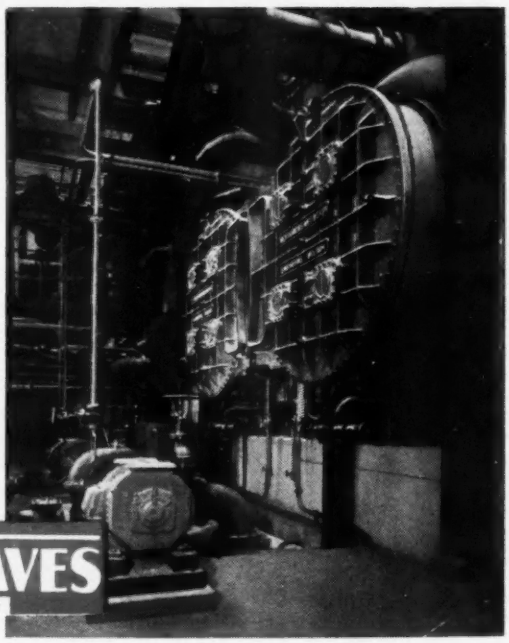

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